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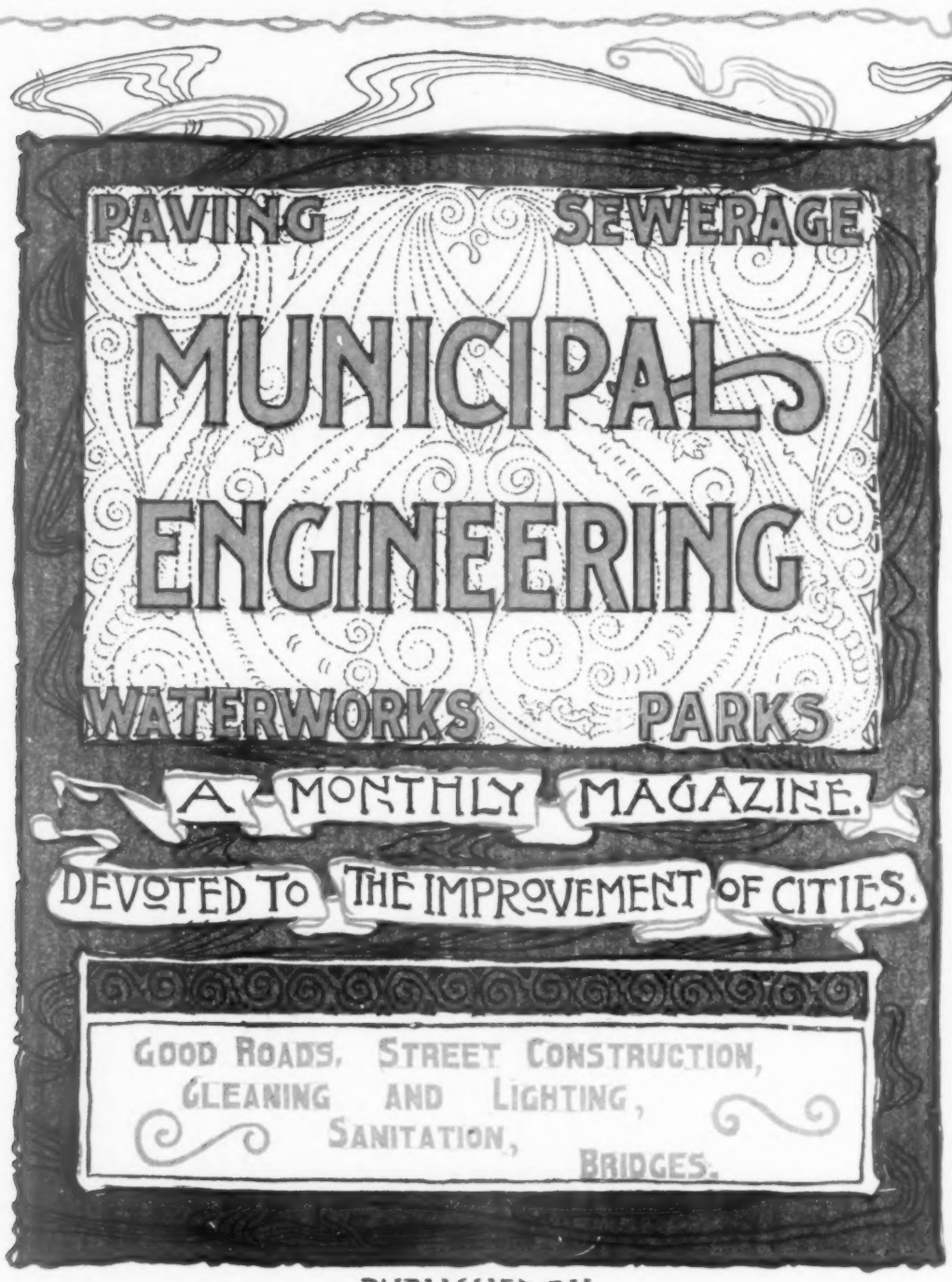

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PUBLISHED BY
MUNICIPAL·ENGINEERING·COMPANY
INDIANAPOLIS NEW YORK

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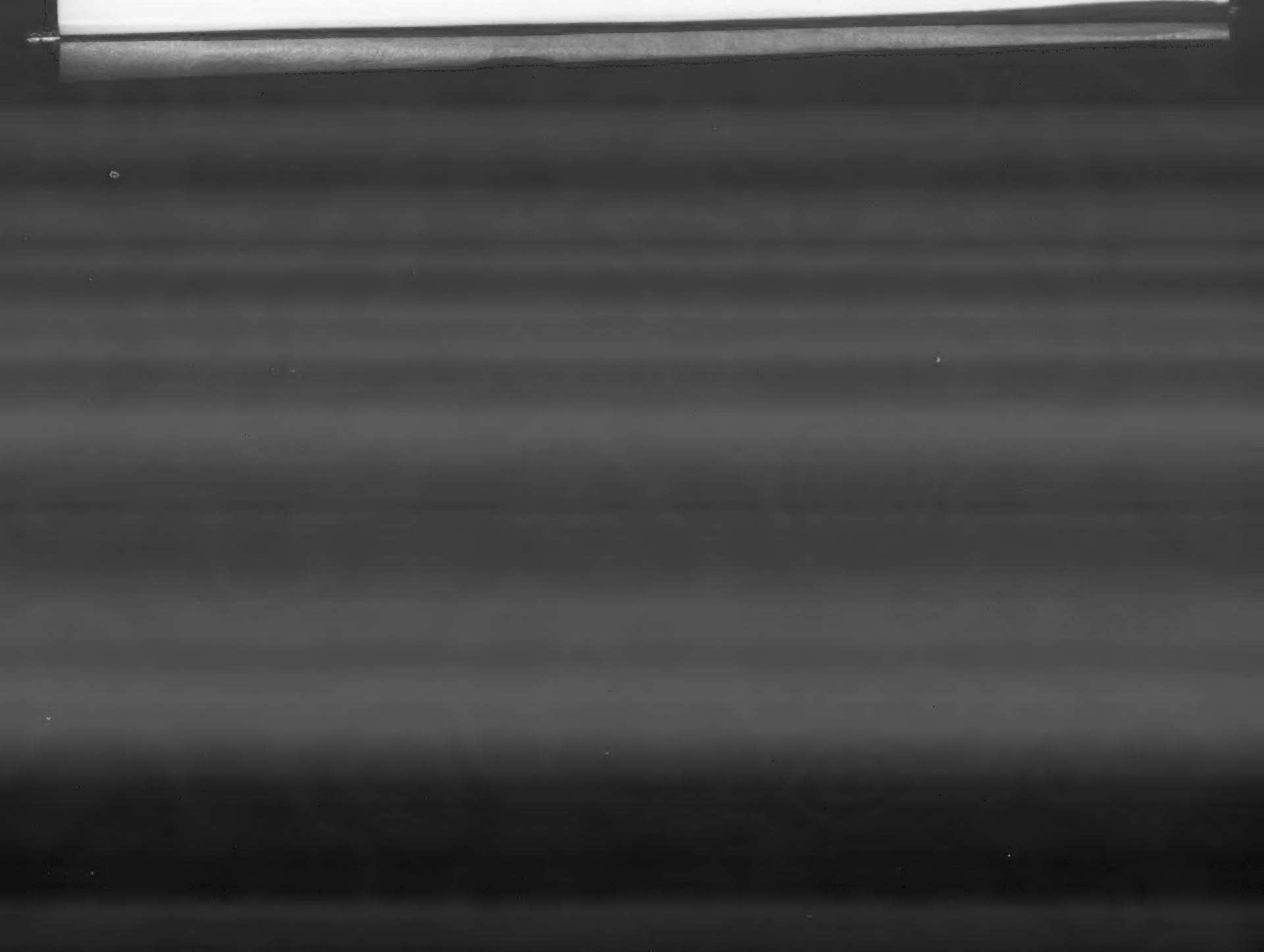

Municipal Engineering

VOLUME XIII. SEPTEMBER, EIGHTEEN NINETY-SEVEN. NUMBER 3.

TREATMENT OF THE EFFLUENT FROM SEWAGE PRECIPITATION WORKS.

By Kenneth Allen, M. Am. Soc. C. E.

From the fact that chemical precipitation will remove but about one-half of the organic matter in sewage, the effluent from such works is liable to subsequent decomposition, which, under unfavorable conditions, is liable to cause a nuisance.

To obviate this, it is becoming customary to subject effluents from chemical precipitation plants to a further treatment which shall oxidize the remaining organic matter, or resolve it in some way into its inorganic constituents, and there are several ways in which this may be done. Some of these methods are somewhat ineffective, while others furnish, if properly conducted, an effluent that will bear favorable comparison with many of our domestic water supplies.

Where the effluent passes into a large body of flowing water not liable to use for domestic purposes, which will insure oxidation of the remaining organic impurities before putrefaction sets in, this may continue to answer every purpose; but where such conditions do not obtain, there is liability to serious cause for complaint in the future, and it is well enough to appreciate this fact before the adoption of treatment by precipitation.

Many towns, however, are situated far from a suitable body of water for crude disposal, and with no available areas for land treatment, and such are almost of necessity forced to adopt some method of chemical precipitation as being best adapted to the circumstances; for it is taken for granted that anything less than some system of water-carriage will not meet the requirements of modern municipal sanitation.

We have in America excellent examples of sewage disposal by the principal well-known methods—plants that will probably compare well with those abroad, although perhaps on a smaller scale. But the denser populations of France, Germany and England have forced these nations to adopt more rigorous measures to prevent the fouling of their water-courses by sewage effluents, and we consequently find there a wider field for the study of this branch of sanitation. We may well profit by the experience of these older countries, especially by noting the trend of modern practice, for pressure is rapidly being brought to bear on many towns in our eastern states to avoid the pollution of their neighboring water-courses by the discharge from sewers.

One of these tendencies is to-

ward the adoption of filtration plants supplementary to chemical precipitation works, and we find a considerable diversity in the precise methods adopted by different towns. The following typical examples of practice abroad indicate that as yet there appears to be no one type of accepted superiority.

Glasgow,* with a poplation of 700,000, treats the sewage from about one-fifth the entire city, or some eleven million imperial gallons per day, by a modern and efficient plant which has been designed to handle ultimately twice this amount. The effluent from the precipitation tanks passes over 24 aerating beds or channels, 40x43 feet in plan; thence, by several channels, to twenty coke filters, each 40x10x3 feet 6 inches. After passing downward through these it is conveyed, in a 3-foot open channel, to forty sand filters, 40x30x2 feet 3 inches, which, when the surface becomes foul, are cleansed by washing with precipitated sewage water. From these filters it passes by a 20-foot effluent channel and through five flap-valves into an outlet chamber and thence to the river Clyde. After passing the coke filter, 72 per cent. of the organic matter has been removed, and after passing the sand filters, this is increased to 81 per cent. The latter treatment reduces the albuminoid ammonia 19 per cent. The cost of filtration is here $1.80 per million imperial gallons in addition to the cost of the chemical precipitation. The latter is effected by the use of sulphate of alumina and lime.

Sheffield, with provision for the sewage from 450,000 persons, treats sixteen million imperial gallons per day with lime, and passes the effluent over aerating weirs, then upward through coke filters two feet in thickness. The coke is renewed about once in three months, the old material being burned under steam-boilers. Each filter contains about 7½ tons of coke.

Bradford, with a population in 1891 of 216,361, employed at that time a similar process. In 1895, however, 40 acres of land was acquired with the intention of utilizing one-half of it for filtering the dry-weather effluent of ten million imperial gallons per day if necessary. Coke has been employed in many of the smaller towns of England where it is readily obtained at moderate cost. After use it is generally utilized as fuel for the generation of the steam required for pumping and sludge-pressing. Animal charcoal is likewise a very efficient filtering medium, but is said to deteriorate rapidly by use.

Leamington filters 600,000 imperial gallons from 20,000 persons through a filter of sand and animal charcoal, having a superficial area of 3,000 square feet after treatment by the A B C process.

Ealing, with a population in 1892 of some 23,000 and an ordinary flow of 600,000 imperial gallons per day only, formerly employed coke as a filter after precipitation with lime and clay. Now, however, the effluent is conducted to three filter-tanks 24 x 25 x 9 feet, in the center of which, instead of coke, is placed a piece of heavy cocoanut matting. This is washed down every time the tank is emptied, or about three times a week, and the sludge burned. One tank is kept empty for use during

* See pamphlet describing the works, by Thomas Melvin, Manager, December, 1895. Also, "Report of the General Manager of the Dalmarnock Sewage Works, for the year ending 30th April, 1896."

storms. The capacity of these tanks is said to be inadequate.

Some of the above plants are believed to effect a pretty thorough clarification, but where reliance is placed on a straining process simply, the effluent will not bear comparison with one obtained by the intermittent filtration through sand, the soil or any granular material that offers a home for the bacteria on which the purification is now known to depend.

Birmingham* employs the effluent after precipitation with milk of lime in irrigating 1,000 acres of 1,299 acres of farm land owned by the city. The daily output from a population of 650,000 persons is twenty-three million imperial gallons. The soil under cultivation is sand and gravel overlaid by about a foot of loam. It is underdrained, at a depth of 6 feet, by 3-inch and 4-inch drains, spaced 33 feet and in some cases 16½ feet apart, discharging to outfall mains from 9 to 18 inches in diameter. The sewage from 40,000 persons is received crude and mixed with the effluent from the precipitation tanks. The farm, on which celery, cabbages, mangolds, grass, apples, plums, etc., are raised, just about pays working expenses, while the precipitation plant costs some $60,000 per annum for operating expenses. The effluent from the farm is said to be very pure. It has been estimated that, while an acre of the farm will serve for the clarified effluent from 500 persons, it could take the crude sewage of but 200 or 300.

Wimbledon, with a population in 1891 of 28,000, treats its sewage with lime and herring brine, and distributes the effluent on 45 acres of land, 10 of which are planted with osiers, and take the surplus flow after heavy rains. The clay subsoil is drained at a depth of 6 feet by pipes laid 60 feet apart.

Osiers will stand large doses of clarified sewage which they absorb, but where crude sewage has been applied to them the results have not always been satisfactory. They are grown on many sewage farms in England.

†Leeds has a population of some 400,000 and a daily flow of over fourteen million imperial gallons per day. The effluent, after precipitation with lime and sulphate of alumina, is here also filtered by passage through 6 feet of soil.

The intermittent filtration of the clarified effluent from precipitation works through sand is a method now admitted to be particularly effective, one requiring a comparatively small area, and one generally adapted to the conditions prevailing where a precipitation plant is located near a large town.

Manchester furnishes a good example of this method of treatment. In 1894, a population of 520,211 furnished some sixteen million imperial gallons of sewage per day. The works are constructed on the basis of a population of 625,000, furnishing twenty-one million imperial gallons per day. After treatment with sulphate of alumina and lime, the effluent passes by a channel to the filter beds. For these there have been acquired 112 acres of land at Davyhulme, and 213 acres at Flixton, two miles distant. At present but 30 acres are prepared, these being laid out in two beds of equal size. They are drained by 18-inch mains placed 200 feet apart, with

*See "Rep. of Streets and Sewerage Committee, and Thos. Hewson, City Engineer," Leeds, 1894.

†Address of Mr. A. W. Fowler before the Incorporated Association of Municipal and County Engineers, 1894.

6-inch branches 30 feet apart. The effluent is discharged into the Manchester Ship Canal.

Coventry treats its sewage effluent in a similar way on filter beds covering an area of nine acres. The population is about 45,000, and the daily output is two million imperial gallons of a very foul sewage.

Salford, also, with a population of nearly 200,000, and a daily discharge of about nine million imperial gallons per day, has planned to filter the effluent after treatment through six beds containing 2,040 square yards, each five feet in depth, at a rate of 582 imperial gallons per square yard of total filter area.

In the vicinity of large cities even the comparatively moderate area required for intermittent filtration may be difficult to obtain. That such an area is not insignificant is seen at once by calculation. Assuming a population of 100,000 and a discharge of 100 gallons per head per day there are 10,000,000 gallon per day to provide for. Now, if, under very favorable conditions—including selected materials, careful grading, thorough underdrainage and efficient supervision—we may assume an average rate of filtration of 80,000 gallons per acre, which is a high rate for actual practice, we find an area of 125 acres will be required for the filter beds alone, exclusive of roads, buildings, etc.

The rate of filtration may be greatly increased, as has been shown by experiments made by the Massachusetts State Board of Health, at Lawrence, Mass., and by Col. Geo. E. Waring, Jr., at Newport, R. I., by the artificial aeration of the filter beds.* Air forced through the sand by compressors appears to stimulate the bacterial action which effects the purification of the sewage, and the excess of oxygen retained in the effluent acts favorably in preventing subsequent putrefactive changes. But it will be seen that such a method would prove exceedingly costly, both for installation and for operation, when applied on a large scale.

Some recent experiments made by Dr. George Reid on the filtration of sewage through coal at Wolverhampton would indicate that a high degree of purification may be attained with this material. The filter was 42 inches thick and composed of graduated layers of coal, the top layer being fine dust. With a filter 60 inches in thickness sewage was passed at a rate of 1,000,000 gallons per day for twelve hours, the next twelve hours being allowed for aeration of the filter. Filters of this kind gave, according to analyses made of the effluent, a purification of some 80 per cent.

The efficiency of coal as a filtering medium was believed to be due to its porous character offering a home for the vitrifying organisms. And so long as there is a structure which will allow of a free circulation of air through the mass, it is quite possible that other substances, such as coke breeze, might prove equally efficacious with intermittent filtration.

There is yet another filtration medium which deserves mention from the thoroughness of the purification obtained at a reasonable cost, namely, polarite. This substance has been described in a let-

* According to Mr. Waring an aerator, constructed as described by him, "will remove over 95 per cent. of the organic nitrogen of a strainer effluent, applied at a rate of at least 800,000 gallons per acre per day. It will continue to do this for an indefinite period, providing suitable arrangements are made for removing sludge at frequent intervals." The filtration in this method may be continuous.

ter to the writer by Mr. Andrew Howatson, Assoc. M. Inst. C. E., as being "made from the carbonate of iron found in the coal measures, calcined and treated and then broken up in powder of size of split peas." Its weight is given* as about 2,100 pounds per cubic yard and an analysis by Sir Henry E. Roscoe furnishes the following constituents:

Magnetic oxide of iron	53.85
Silica	25.50
Chalk	2.01
Alumina	5.68
Magnesia	7.55
Carbonates—water	5.41
	100.00

The peculiar property by which it is claimed polarite is enabled to accomplish an effective purification with a rapid rate of filtration, is that of condensing oxygen from the air on its surface, presumably in a similar manner to spongy platinum. This oxygen, during the process, is disengaged, and actively oxidizes the organic matter in the effluent with a result comparable to that obtained by the use of compressed air in the artificial aeration of filters.

Aside from an effective purification, two decided minor advantages are found in the use of polarite: First, The rapidity of filtration has been found to prevent the formation of ice on the surface of the filter during cold weather; and, secondly, the polarite has been found to require no renewal, being unaffected by ordinary conditions of temperature and moisture. In other words, its efficiency is not due to chemical action, nor is it used up thereby; but its value consists in its agency as a condenser of oxygen, the latter effecting directly the desired purification.

*See Proc. Inst. C. E., Vol. CXVII.

Polarite is usually, but not always, employed in treating sewage effluents after precipitation by ferozone. This substance is a powerful precipitant and deodorizer, the constituents of which are varied in proportion according to the character of the sewage to be treated.

A sample analyzed by Dr. Arthur Angell, of Southampton, gave the following result:

	Per Cent.
Sulphate of alumina	69.00
Ferrous sulphate	10.50
Ferric "	5.60
Total soluble	85.10
Ferric oxide	12.50
Alumina and silica	2.40
Total insoluble	14.90

It is claimed that the use of ferozone facilitates the subsequent oxidation of the effluent by the polarite, and, also, that the sludge contains a larger percentage of ammonia than that where lime has been used, and is hence of more value as a fertilizer.

The first large plant to use this process was installed at Acton, England, some eight or ten years ago, and is briefly described by W. Santo Crimp, in his work on "Sewage Disposal." Since then it has been introduced at Hendon, Swinton, Royton, Hyde, Huddersfield, Norwood, Walsall, Melton, Mowbray, and many smaller towns.

The plant at Huddersfield is, so far, the most extensive, treating the effluent of about 98,000 persons, or 9,000,000 imperial gallons per day. Here ten to twenty grains of ferozone per gallon are used, depending on the strength of the sewage, costing 28 shillings per million gallons of sewage treated. The effluent passes from the precipitation tanks to the polarite filters. These contain a 10-inch layer of polarite and sand mixed in the pro-

portion of 6 parts of polarite to 4 of sand, and cover an area of 4,460 square yards. The polarite costs £4 13*s*. 9*d*. per ton delivered.

The sludge does not find a market as a fertilizer, but is forced by compressed air through pipes and deposited on low-lying land.

Mr. R. S. Dugdale, the borough surveyor, who has kindly furnished the writer data concerning these works, states that their capital cost, exclusive of real estate, was £75,000 and that the annual cost of operation, "including rent (interest on outlay), rates and taxes," is approximately £11,000. This is equivalent to about $14.00 per million U. S. gallons, or 56 cents per capita annually.

In more recent works sand filters or strainers, known as clarifiers, are interposed between the precipitation tanks and the polarite beds. These are said to allow a reduction in the amount of ferozone used and an increase in the rate of filtration through the polarite beds, resulting, consequently, in a material economy in operation; and the authorities at Huddersfield are considering the adoption of clarifiers in their works.

The plant at Melton-Mowbray, which has been in operation but a year and a half, makes use of clarifiers between the precipitation tanks and the polarite beds. Here* the affluent (about 250,000 imperial gallons per day) is passed through four clarifiers, each 6 feet in diameter and 7 feet high. These "remove the last traces of suspended matter from the tank effluent, and discharge on to the polarite filters a perfectly clean liquid. * * * The clarifiers are estimated to work at the rate of 3,000 gallons per square foot per twenty-four hours, but are really working at a higher rate than this. The great feature of these clarifiers is that they can be cleaned by a reverse flow of water under a very low pressure, only 3 feet or 4 feet head being required. * * * The clarifiers are cleaned about every four to six hours. This operation occupies about ten minutes only, the solid matter retained by the clarifier being washed out and run back for retreatment.

"After leaving the clarifiers, which are arranged to work with a head of a little over two feet (although they wash with from three feet to four feet head), the water passes on to the three powerfully active polarite filters, each having a layer of the filtering medium polarite two feet deep, by means of which the chemically treated and clarified sewage is finally purified at a rate of filtration of 4,000 gallons per square yard per twenty-four hours. * * * The resulting effluent is clean and sparkling as spring water."

Mr. Edmund Jeeves, surveyor to the Melton-Mowbray Urban District Council, writes that while the system "requires very constant and careful attention in working, the effluent is especially good and fit to be discharged into any public stream without causing nuisance." He adds: "Before adopting the system I, with a committee of my council, visited several works with the latest improved systems in this country, and we came to the conclusion that the International was the most simple and effective."

It has been recently claimed that such clarifiers may be proportioned to pass 36,500 imperial gallons per square yard per 24 hours. In other words, one clarifier 13 feet in diameter and 11 feet high will suffice for a flow of 555,000 imperial gallons per day. These have been em-

* Industries and Iron, May 1, 1896.

ployed in the sewage-disposal works of Manchester and are to be adopted in the new plant at Toulon, France. They cost about $2,000 apiece.

The polarite filters are said to cost from $20 to $30 per square yard to construct, and these will provide for from 1,000 to 1,200 imperial gallons per square yard after delivery from the clarifiers. At Huddersfield, without the use of clarifiers, the rate of filtration was about 2,000 imperial gallons per square yard. Of course, the precise duty per square yard should depend on the quality of the sewage and on the requisite degree of purification. It is not a fixed ratio. The polarite costs about $23 per ton delivered at Huddersfield and $30 per ton at Swansea.

The filter is generally about 30 inches in thickness, composed of several layers of broken stone and sand, one of which layers contains about 6 inches of polarite. The whole is, of course, underdrained by suitable pipes.

The cost of operation, including precipitation with ferozone, pressing sludge and filtration through polarite, but exclusive of interest and sinking-fund charges, is stated to be, in England, from $6.25 to $7.50 per million gallons of sewage treated.

Biological examinations have also indicated a high degree of purification. This is of especial significance in those cases in which the effluent passes to a water from which a water supply is subsequently drawn. Such sources of supply may be open to criticism, but for many years our towns, situated on the great lakes, and on such streams as the Hudson, Ohio, Mississippi and Missouri rivers, will continue to use these waters for domestic purposes, and it remains to do all that can be done to prevent their unnecessary pollution.

Dr. A. Billet has made analyses of an effluent after filtration, at the rate of 9,500 liters per square meter per day,* and finds—

1. In the original sewage, 5,250,000 aerolic bacteria per cu. c. m.

2. After precipitation by ferozone, 812,500 aerolic bacteria per cu. c. m.

3. After filtration through polarite, 42,000 aerolic bacteria per cu. c. m.

More recent examinations, made by Dr. Miguel, of Montsouris, have been officially reported, in which *all* the bacteria (27,500 per ccm.) were removed by filtration of the sewage, from an educational institution in that city (after precipitation), through polarite.

It may be a little premature to surmise what place this method of subsequent purification is entitled to assume, or to state definitely its relative value among those previously described, but from its increasing use abroad, and from the favorable reports which have been received, it would appear that under certain conditions it might be employed to advantage in this country.

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* 1,750 imperial gallons, or 2,100 U. S. gallons per sq. yd.

COMPARISON OF WATER RATES AND RULES.

Some time ago, Mr. Dabney H. Maury, Jr., superintendent of the Peoria Water Company, collected information through correspondence regarding the rules, rates and general practice in the management of water-works in American cities, embracing forty-four private water companies and fifty-six city water departments. The Peoria Water Company is operated under a receivership, and the information gathered by Mr. Maury, after compilation, was set forth in a sworn report filed in court. One of the leading water-works managers of the country, in a letter to the editor of MUNICIPAL ENGINEERING, asks the publication of the information in Mr. Maury's report, and Mr. Maury, in compliance with our request, has courteously furnished for this purpose the data collected by him, covering rates per 1,000 gallons, minimum meter rates, the practice as to payment for meters, service pipes, etc., a condensed statement of which is given below:

PRIVATE WATER COMPANIES.

Alton, Ill.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance when he desires meter; no minimum stated; meter rates, 50c. to 40c. per 1,000 gallons.

Austin, Texas.—Consumer pays for service pipe; consumer pays for meter and setting when he desires meter, but can only require meter when his monthly rate exceeds $5.

Belleville, Ill.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance when he desires meter; no minimum mentioned; meter rates, 50c. to 45c. per 1,000 gallons; but few meters in use.

Birmingham, Ala.—Consumer pays for service pipe; meter rental $3 to $100 per annum, according to size, in addition to charges for water used; minimum meter rate in no case less than fixture rates; company reserves right to furnish water at meter or fixture rates at its option; meter rates from 30c. to 8c. per 1,000 gallons.

Burlington, Iowa.—Consumer pays for service pipe; meters at company's option; minimum rate, smallest meter, $1.40 per month; meter rates from 40c. to 20c. per 1,000 gallons.

Butte, Montana.—Meters at company's option; meter rent $1 per month, when water amounts to less than $10 per month; meter rates not stated.

Cairo, Ill.—Consumer pays for service pipe; if consumer pays for meter and setting, minimum rate, 75c. per month; if company furnishes meter, minimum $3 per quarter; meter rates 30c. to 10c. per 1,000 gallons; company furnishes water at meter or fixture rates at its option.

Charlestown, S. C.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance; minimum meter rate, $12 per annum; meter rates, 60c. to 25c. per 1,000 gallons.

Chattanooga, Tenn.—Consumer pays for service pipe; not stated who supplies meter, presumably the party desiring it; minimum meter rate, $12 per annum; meter rates 40c. to 8c. per 1,000 gallons.

Chillicothe, Ill.—Consumer pays for service pipe; meters at company's option; meter rates, 50c. to 40c. per 1,000 gallons.

Council Bluffs, Iowa.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance; meters at company's option; meter rates, 35c. to 15c. per 1,000 gallons.

Danville, Ill.—Consumer pays for service pipe; meters at company's option; furnished and maintained at company's expense; minimum meter rate, $3 per month; Meter rates, 50c. to 20c. per 1,000 gallons.

Davenport, Iowa.—Consumer pays for service pipe; company furnishes meter; minimum rate, $1 per month for smallest meters; meter rates, 40c. to 10c. per 1,000 gallons.

East St. Louis, Ill.—Consumer pays for service pipe; meters at company's option; if consumer desires a meter, he pays for meter, setting and maintenance, and a minimum meter rate of $1 per month for smallest meter; meter rates, 30c. to 12½c. per 1,000 gallons.

Eau Claire, Wis.—Not stated who pays for service pipe; consumer pays for meter, setting and maintenance; meters at company's option; meter rates, 30c. to 10c. per 1,000 gallons.

Fort Scott, Kan.—Consumer pays for service pipe; consumer pays for meter and all expenses connected therewith, if he asks for it; no minimum stated; meter rates, 25c. per 1,000 gallons.

Freeport, Ill.—Consumer pays for service pipe; meter at company's option; minimum rate, $6 per year, in addition to meter rental; meter rates, 50c. to 12½c. per 1,000 gallons.

Galena, Ill.—Consumer pays for service pipe; meters at company's option and consumer's expense; meter rates 50c. to 15c. per 1,000 gallons.

Hackensack, N. J. (Supplying Hoboken, Englewood, Cherry Hill, Hackensack, Union Hill and Weehawken, N. J.)—Consumer pays for service pipe; meters at company's option; minimum meter rates, $2.50 per quarter for smallest meter; meter rates, 23⅓c. to 20⅔c. per 1,000 gallons.

Hannibal, Mo.—Company puts in service pipe, charging for stop-cock and box; consumer pays for meter and all expenses; minimum rate, $4 per year; meter rates, 50c. to 20c. per 1,000 gallons.

Kansas City, Mo.—Consumer pays for service pipe; minimum rates on consumer's meters, 75c. per month; minimum rates on company's meters, $2 per month; meter rates, 36c. to 9c. per 1,000 gallons.

Kingston, N. Y.—Meters at company's option; schedule fixture rates as minimum, but in no case less than $6 per annum; meter rates, 30c. to 8c. per 1,000 gallons.

Indianapolis, Ind.—Consumer pays for service pipe; company pays for setting meter; minimum meter rate, $20 per year on meters set by company; meter rates, 25c. to 6c. per 1,000 gallons.

Lexington, Ky.—Minimum meter rates, 75c. per month on company's meters, 50c. per month on consumer's meters; meters set at company's option; meter rates, 25c. to 15c. per 1,000 gallons

Leavenworth, Kan.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance if he requires meter; minimum rate, $6 per annum; meter rates, 50c. to 20c. per 1,000 gallons.

Louisville, Ky.—Minimum meter rate, $5.40 per month; meter rates, 15c. to 6c. per 1,000 gallons.

Lima, Ohio.—Not stated who pays for service pipe or meter, presumably the applicant; minimum meter rate, $15 per annum; meter rate, 8c. per 1,000 gallons.

Memphis, Tenn.—Company pays for service pipe inside of city limits; minimum meter rates $2.50 per month; meters at company's option; meter rates, 45c. to 8c. per 1,000 gallons.

Menominee, Mich.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance; minimum rate, $2 per quarter; meter rate, 20c. to 10c. per 1,000 gallons.

Muscatine, Iowa.—Consumer pays for service pipe; meter rental, $4 per year; minimum rate, $12 per year; meter rates, 30c. to 10c. per 1,000 gallons.

New Orleans, La.—Consumer pays for service pipe; meters believed to be at company's option; meter rent in addition not stated; meter rates, 40c. to 25c. per 1,000 gallons.

Oakland, Cal.—Consumer pays for service pipe; consumer pays for setting meter; minimum meter rate, from $4 to $10 per month; meter rates, 55c. to 30c. per 1,000 gallons.

Ogden, Utah.—Consumer pays for service pipe; minimum meter rates on company's meters, $8 per month. (Also, $3 and upward. See letter.) General meter rates, 35c. to 15c. per 1,000 gallons.

Plainfield, N. J.—Consumer pays for service pipe; all meter rates, and setting meters, are at the option of the company.

Quincy, Ill.—Consumer pays for service pipe; consumer pays for setting meter; minimum rates, $15 on company's meters (10 per cent. off for prompt payment); minimum rates, $12 on consumers' meters (10 per cent. off for prompt payment); meter rates, 45c. to 14¼c. per 1,000 gallons.

Racine, Wis.—Consumer pays for service pipe; consumer pays for setting meter; minimum meter rate, $2.50 per quarter; meter rental, $1 to $17 per quarter; meters at company's option; meter rates, 30c. to 6c. per 1,000 gallons.

San Francisco, Cal.—Consumer pays for service pipe; minimum meter rate, $4 per month; meter rates, 40c. to 22⅔c. per 1,000 gallons.

Sedalia, Mo.—Consumer pays for service pipe; minimum rates, $3 per month on company's meters, or $1 per month, if 3-year contract is made; minimum rates, 75c. per month on consumers' meters; meter rates, 30c. to 12½c. per 1,000 gallons.

Stillwater, Minn.—Company pays for service pipe; consumer pays for setting meter; minimum meter rate, $20 per year; meter rates, 50c. to 30c. per 1,000 gallons.

Streator, Ill.—Consumer pays for service pipe; meters at company's option; meter rates, 50c. to 10c. per 1,000 gallons.

Terre Haute, Ind.—Consumer (generally) pays for service pipe; minimum rates, for premises using partial supply from company, from $2 per month upwards; meters set at company's option; meter rates, 30c. to 15c. per 1,000 gallons.

Topeka, Kan.—Consumer pays for service pipe; minimum rates on company's meters, $3 per month; minimum rates, on consumers' meters, 75c. per month; meter rates, 50c. to 12½c. per 1,000 gallons.

Utica, N. Y.—Consumer pays for service pipe; minimum meter rate, on consumers' meters, $7 per annum; on company's meters, a rental in addition is charged; meter rates, 30c. to 7½c. per 1,000 gallons.

Wilmington, N. C.—Consumer pays for service pipe; minimum meter rate for small meter, $10; meters at company's option; meter rates, 20c. per 1,000 gallons.

CITY WATER-WORKS.

Atlanta, Ga.—City pays for service pipe; consumer pays for meter, maintenance and setting; minimum meter rate 85c. per month; all water furnished by meter; rates, 17c. to 6c. per 1,000 gallons.

Aurora, Ill.—Consumer pays for service pipe (presumably); consumer pays for

meter, setting and maintenance; minimum rate $1.50 per quarter; meter rates, 40c. to 8c. per 1,000 gallons.

Baltimore, Md.—Consumer pays for service pipe; consumer pays for meter; setting and maintenance; minimum meter rate $2.50 per quarter; meter rates, 6c. per 1,000 gallons.

Bay City, Mich.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance, if he desires meter; no minimum stated; meter rates, 10c. to 5c. per 1,000 gallons.

Bloomington, Ill.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance; minimum meter rate $4 per year; meter rates, 15c. to 12c. per 1,000 gallons.

Boston, Mass.—Consumer pays for service pipe; consumer pays for maintenance of meter; if meter yields less than assessed rate, it is removed; minimum meter rate, $15 per year; meter rates, 18⅔c. to 10⅔c. per 1,000 gallons.

Brockton, Mass.—Consumer pays for service pipe; consumer pays for meter, or a rental for same, of from $1.40 to $6.30 per year; minimum meter rate, in addition to above, $8 per year; meter rates, 30c. to 20c. per 1,000 gallons.

Brookline, Mass.—Consumer pays for service pipe; city furnishes meters at a rental of from $2 per annum upwards, in addition to charges for water used; meter rate, 20c. per 1,000 gallons.

Buffalo, N. Y.—Consumer pays for service pipe; city generally pays for meters; consumer pays for maintenance; minimum meter rate $100 per annum; meter rate, 6c. to 3c. per 1,000 gallons.

Burlington, Vt.—Consumer pays for service pipes over ½ inch diameter; city will furnish ½ inch service pipes; city will furnish smallest size meter; consumer pays for setting and maintenance, and for larger sizes; minimum meter rate, $2.50 per quarter; meter rates, 33⅓c. to 13⅓c. per 1,000 gallons.

Chicago, Ill.—consumer pays for service pipe; consumer pays cost of meter, maintenance and setting; minimum meter rate never less than assessed frontage rates; meter rates, 10c. to 8c. per 1,000.

Cincinnati, Ohio.—Consumer pays for service pipes; consumer pays for meter, setting and maintenance; minimum meter rate, $25 per year; meter rates, 15c. to 9c. per 1,000 gallons.

Cleveland, Ohio.—Consumer pays for service pipes; minimum meter rate, $5 per six months, if meter furnished by city, and $4 per six months if meter furnished by consumer; meter rates 5⅓c. per 1,000.

Columbus, Ohio.—Consumer pays for service pipes; no minimum rate, but supply furnished by meters or not at option of superintendent; meter rates, 6c. per 1,000 gallons.

Covington, Ky.—Consumer pays for service pipe; minimum meter rate, $2.50 per quarter; meter rental, in addition, $1 per month for smallest meter, up to $30 per month for 6-inch meter; meter rates, 20c. to 11c. per 1,000 gallons.

Decatur, Ill.—Meter contracts at option of board and all special.

Detroit, Mich.—Consumer pays for service pipe; minimum meter rates, $9 per year; meters at option of water board; meter rates, 6⅔c. to 3⅓c. per 1,000 gallons.

Elgin, Ill.—Consumer pays for service pipe; meter or fixture rates at superintendent's option; minimum meter rates $10 or $15 per annum; meter rates, 30c. to 10c. per 1,000 gallons.

Erie, Pa.—City pays for small size connection; consumer for larger sizes; consumer pays for meter, setting and maintenance if he desires meter; minimum meter rate in no case less than assessed annual rates; meter rates, 10c. to 6c. per 1,000 gallons.

Evanston, Ill.—Has no meters on small consumers. Only 2 in service; meter rates, 8c. per 1,000 gallons.

Fall River, Mass.—City pays for service pipe; consumer pays for meter, setting and maintenance; minimum rate, $8 per year; meter rates, 28c. to 10c. per 1,000 gallons.

Fort Wayne, Ind.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance; minimum meter rate, $4 per annum; meters at city's option; meter rates, 10c. to 6½c. per 1,000 gallons.

Galesburg, Ill.—Consumer pays for service pipe; consumer pays for meter and setting; minimum meter rate, 50c. per month; meter rates, 37½c. to 6¼c. per 1,000 gallons.

Grand Rapids, Mich.—Consumer pays for service pipe; city furnishes meter, but will supply at meter or fixture rates at its option; minimum meter rate, $1.25 per quarter; meter rates, 20c. to 4⅔c. per 1,000 gallons.

Hartford, Conn.—City and consumer each pay for part of service pipe; water commissioners place meters wherever they think the income will be increased over regular water rates; meter rates, 30c. to 10c. per 1,000 gallons.

Joliet, Ill.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance, if he desires meter; meter rates in no case less than annual frontage rates, and minimum meter rate $10 per year; meter rates, 10c. to 8c. per 1,000 gallons.

Jacksonville, Ill.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance; meters at option of board; minimum meter rate $2.50; meter rates, 40c. to 10c.

Jersey City, N. J.—Consumer pays for service pipe; meters at option of board; meter rates, 20c. to 10c. per 1,000 gallons.

Lawrence, Mass.—Consumer pays for service pipe (presumably); consumer pays

for meters, setting and maintenance; minimum meter rate, $10 per year; meter rates, 20c. to 4c. per 1,000 gallons.

London, Ontario.—City pays for service pipe (generally); meter rental, in addition to charge for water used, from $1 to $7 per quarter; meters at option of board; meter rates, 20c. to 10⅔c. per 1,000 gallons.

Madison, Wis.—Consumer pays for service pipe; consumer pays for setting meter, and for meter and maintenance, if set at his request; minimum rate, $5 per annum; meter rates, 20c. to 5c. per 1,000 gallons.

Manchester, N. H.—City pays for service pipe; city pays for meter; minimum meter rate, $12 per year; meter rates, 20c. per 1,000 gallons.

Milwaukee, Wis.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance; no minimum rate stated; meter rate, 20c. to 5c. per 1,000 gallons.

Minneapolis, Minn.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance, if he desires meter; minimum meter rate, $5 per year; meter rate, 20c. to 10c. per 1,000 gallons.

Moline, Ill.—Consumer pays for service pipe; consumer pays for setting meter; no meters furnished to parties whose rates are less than $2 per month; meters at city's option; meter rates, 20c. to 8c. per 1,000 gallons.

Nashville, Tenn.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance or pays rental for same; meter rates 15c. to 7c. per 1,000 gallons.

Newark, N. J.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance; meters at city's option—compulsory on taps of more than ⅝ inch diameter; meter rates, 15c. per 1,000 gallons.

Newton, Mass.—City pays for service pipe; consumer pays meter rental of from $2 upwards, and minimum meter rate of $10 for water; meter rates, 35c. to 12c. per 1,000 gallons.

New York City.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance; meters at city's option; meter rates not given.

Pawtucket, R. I.—Consumer pays for service pipe; city furnishes ⅝ inch meter to all parties using 3 or more faucets; maintenance and setting paid by consumer; minimum rate, $5 per annum; meter rates, 30c. to 6c. per 1,000 gallons.

Philadelphia, Pa.—Consumers pay for service pipe; consumer also pays frontage tax of $1 for each front foot of lot before service is laid; city furnishes meter, but will not do so unless net income is increased thereby; meter rates, 8c. per 1,000 gallons.

Pittsburg, Pa.—Consumer pays for service pipe; no meters in use.

Portland, Ore.—Consumer pays for service pipe; city owns meters, has option of meter or fixture rates; minimum meter rate, 80 per cent. of schedule rates; meter rates, 30c. to 15c. per 1,000 gallons.

Providence, R. I.—City pays for service pipe; consumer pays for meter, setting and maintenance; minimum meter rate, $10 per annum; meter rates, 20c. to 15c. per gallons.

Richmond, Va.—Consumer furnishes service pipe; city lays it; consumer pays for meter, setting and maintenance, or a rental for meter; no minimum stated; meter rates, 15c. to 7c. per 1,000 gallons.

Rochester, N. Y.—Consumer pays for service pipe; consumer pays for meter, setting, and maintenance; minimum meter rates, $5 per annum; meter rates, 14c. to 10c. per 1,000 gallons.

Rockford, Ill.—Consumer pays for service pipe; meters at city's option, and only placed on services of large consumers; meter rates, 40c. to 20c. per 1,000 gallons.

Rock Island, Ill.—Consumer pays for service pipe (presumably); consumer pays for meter and setting, if rate is less than $100 per year; meter rates, 30c. to 5c. per 1,000 gallons.

South Bend, Ind.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance; meters optional with city; minimum meter rate, $5 per month; meter rates, 10c. to 6c. per 1,000 gallons.

Springfield, Ill.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance, if he desires meter; city has option of furnishing by meter or by fixture rates; meter rates, 20c. to 8c. per 1,000 gallons.

Springfield, Mass.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance, if he desires meter; minimum meter rate, $10 per annum; meter rates, 30c. to 7c. per 1,000 gallons.

St. Louis, Mo.—Consumer pays for service pipe; consumer pays for meter, setting and maintenance; meters at city's option; meter rates, 30c. to 12½c. per 1,000 gallons.

St. Paul, Minn.—Consumer pays for service pipe; consumer pays for setting meter; minimum meter rate, $1 per month; meter rates, 20c. to 10c. per 1,000 gallons.

Taunton, Mass.—City pays for service pipe; consumer pays for meter and setting; minimum meter rate, $10 per year; meter rates, 25c. to 9c. per 1,000 gallons.

Wheeling, W. Va.—Consumer pays for service pipe; only two or three meters in use; meters at option of board and at expense of consumer; meter rates, 15c. per 1.000 gallons.

Wilmington, Del.—Consumer pays for service pipe; water meters, special rates; not set on residences.

Dabney H. Maury, Jr., M. E.

It will be seen that it is the general rule for private water compa-

nies, and for city water departments, to require consumers to pay for service pipes.

It will also be seen that it is the general rule with corporations, as well as with city water departments, that the consumer either pays for meter, setting and maintenance, whether he desires a meter or not; or that the consumer pays for meter, setting and maintenance, or a rental for meter, if he desires meter; or that the consumer pays a minimum meter rate large enough to cover the cost of supplying his service; or that the water company or city water department, as the case may be, reserves the option of furnishing water by fixture or meter rates.

In no case is the water company or city water department compelled, at the request of a consumer, to pay for a service pipe and for a meter and its setting and maintenance, and to furnish water by meter rates, unless a minimum meter rate is paid large enough to protect the water company or water department against loss.

THE NEW PAVING SPECIFICATIONS OF OMAHA.

Mr. Andrew Rosewater, city engineer of Omaha, has prepared a new set of paving specifications for use in the work under his direction. The forms for submitting bids and the classification of work are reproduced here. The specifications are as follows:

ASPHALT PAVEMENTS.

Quality of Asphalt Paving and Formulas.—The bidder must give the service and character of the asphalt to be used and its state of purity. He must give the proportions, with proposed limit of variations of each of the ingredients, and a full description of the proposed process of preparing and laying the composition. In giving latitude to the various methods for making the paving surface, it is hereby expressly agreed by the contracting parties that the asphalt pavement shall be equal to the best asphalt pavement heretofore laid in the city of Omaha, and the guarantee of maintenance shall not relieve the contractor from furnishing, when completed, a pavement with a good, smooth surface, suitable for the various demands of street traffic. The pavement must not become so pliant as to make it unsuitable for practical use during the hot summer weather, nor so unyielding as to crack in cold weather, to an extent to cause rapid disintegration.

The asphaltum for paving purposes shall be of the best quality of the kind named in the proposal, and shall be laid substantially according to the formula accompanying the proposal, which shall, in each case, be treated as part of the specifications and contract. The material shall be brought and put down when heated to the proper temperature for best results, and, when properly mixed, shall be evenly spread and well and thoroughly rolled and compacted with a roller weighing not less than 250 pounds per running inch, so that when finished it shall possess the thickness named in the respective classification designated to be laid. The pavement must, when finished, present a homogeneous mass, all the material of which shall form a good and perfect bond. No pavement shall be laid when the atmospheric temperature is below forty degrees Fahrenheit, or when the weather is deemed unsuitable by the city engineer.

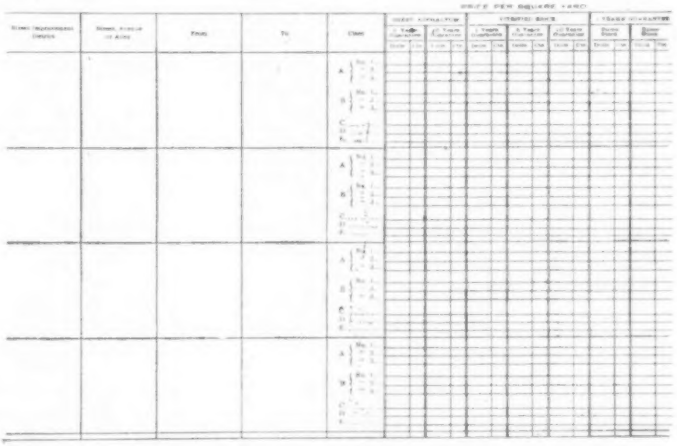
Where broken stone or slag is used for foundation, for sheet asphaltum, it shall be of the size and quality hereinafter specified, and thoroughly compacted, after which the surface shall be coated with a coal tar mixture specially prepared for paving purposes.

Binder.—The second or binder course will consist of a fine bituminous concrete composed of clean broken stone, slag or gravel, not exceeding one and one-half (1½) inches in their largest dimensions, thoroughly screened, and bituminous cement made from not less than one (1) part asphalt to three (3) parts of coal tar. The stone, slag and gravel will be heated by passing through revolving heaters and thoroughly mixed by machinery with the bituminous cement, in the proportions of about fifteen gallons of the bituminous cement to one cubic yard of stone, slag or gravel. This binder will be hauled to the work and spread on the base with hot iron rakes, and immediately rammed and rolled with hand and steam rollers while in a hot

and plastic condition, until it has a thickness of one and one-half (1½) inches. The upper surface will be made exactly parallel with the surface of the pavement to be laid. Upon this base and binder will be laid the wearing surface, or pavement proper.

Stone Blocks, or Bricks, Adjacent to Railway Tracks, in Connection with Asphalt Pavement.—When the pavement is laid next to the track of a street railroad one row of selected or square-dressed stone paving blocks or paving bricks may be required to be laid next to and at right angles to the track in such manner as shown on plans on file in the office of the city engineer, which shall be paid for at the same rate as the asphalt pavement.

The foundation will be similar in all respects to the foundation of the carriageway pavement.



BLANK FORM FOR BIDS.

If the foundation consists of concrete, the base will be covered with a layer of fine, sharp, clean sand, one (1) inch in thickness, and the blocks or brick will be laid directly upon and imbedded in this sand, with closed joints.

The tops of the blocks or brick will be even with the surface of the tread of the rail, which shall conform with the grade of the street.

The blocks or brick will be laid before the wearing service is laid upon the carriage way pavement, and carefully rammed to a firm bed.

The space back of the blocks will be filled to the surface of the base for the carriage way pavement with the same material that is used for said base, well rammed, or such other materal and in such manner as may be directed by the city engineer.

Immediately after the wearing surface shall have been laid, clean, coarse, hot sand will be poured into the joints of the blocks until they become nearly filled.

There will then be poured into the joints an asphaltic composition at a temperature of 300 degrees Fahrenheit, until the joints are completely filled flush with the surface of the pavement. Additional coarse, hot sand will then be poured along the joints, and will be consolidated by tamping with a light rammer. If found necessary, additional asphaltic composition will then be poured between the blocks until the joints are thoroughly filled.

Gutters.—Gutters on streets to be paved with asphaltum, shall be of such width, material and base as shall be specified in the ordinance designating the material to be used. The joints between the bricks or blocks shall be filled with a liquid asphalt, poured in at a temperature of 300 degrees Fahrenheit, after which the surface shall be covered with one inch of fine, hot sand, and tamped over the entire surface of the gutter. The outer edge of such gutters shall be toothed into the pavement according to plans. All gutters will be paid for at the rate of the contract price per square yard for gutters, under the classification to which they belong.

STONE BLOCK PAVEMENT.

Paving Material.—All material for paving, under the various classifications, shall be of the best quality of the kind, free from all defects, and uniform in dimensions as specified. They shall be subjected to rigid inspection, and whenever rejected, shall promptly be taken from the street and not brought back again to the work. The blocks in the pavement shall be arranged in courses of uniform dimensions, as near as may be, and when so directed, the smallest sizes shall be specially selected for pavements upon steep gradients,

Method of Laying Blocks. — Brick and stone blocks must be laid in uniform courses, perpendicular to the surface, and at right angle to the line of the street or alley except at street intersections, to a smooth, true crown, in accordance with the stakes of the city engineer or his assistant in charge. When thus laid, a space of twenty (20) feet shall be left open behind the pavers, to enable thorough inspection, when the blocks shall be immediately covered with clean, dry sand, and then broomed until all the joints become thoroughly filled and then the blocks shall be rammed with rammers from seventy-five (75) to eighty (80) pounds in

Bidders must fill out the left-hand column in figures.

	Bids in Figures		Estimated Quantities	
For extra grading as per specifications, per cubic yard				50
For extra concrete, per cubic yard			5	00
For any extra gravel, per cubic yard			2	00
For any extra broken stone, per cubic yard			1	75
For any extra sand, per cubic yard			1	50
Resetting old curbs, per lineal foot, as per plan				
Readjusting gutter, per square yard, as per plan				
Furnishing and setting new curb, per lineal foot, as per plan				
Furnishing and setting single row flagging for crossings, when ordered, per lineal foot				80

GUTTERS IN CONNECTION WITH ASPHALT PAVING, PER SQUARE YARD.

Bid for Gutters not to exceed prices named.

	Description of Gutter Paving Base	Stone Blocks				Stone Blocks				Paving Brick			
		BID		PRICE		BID		PRICE		BID		PRICE	
		$	Cts.	$	Cts.	$	Cts.	$	Cts.	$	Cts.	$	Cts.
5 Years Guarantee	Concrete Base Six Inches Deep			2	00			2	50			2	50
10 Years Guarantee				2	70			2	60			2	60

Bidders sign here: (_____)
(_____)
(_____)
(_____)

Individual Names and Addresses of Bidders:

Name	Street Number	City or Town	State

BLANK FORM FOR BIDS.

weight, to a firm, unyielding bed. The finished street to have a uniform surface and with proper grade and crown. The whole shall be covered with one (1) inch of clean sand upon the stone.

At street intersections all blocks shall be laid in diagonal courses, so as in no case to be parallel to the line of travel. All courses to be laid so as to break joints with a lap of not less than three (3) inches.

At alley intersections the blocks shall be laid in such form as shall be directed by the city engineer.

In alley paving a park curb shall be laid on each side of the alley, and parallel to the same. The dimensions of said parking curb shall not be less than eighteen (18) inches in length, nor less than twelve (12) inches in depth, and not less than five (5) inches in width, and dressed at the ends so as to form close-fitting joints the whole depth, and shall be measured and paid for at the same price as the pavement proper.

BRICK PAVEMENT.

The brick must be of the best quality of vitrified paving bricks of uniform dimensions, with square and straight edges. They must be uniformly burned and annealed for street paving, with an absorption of less than two per cent. of their weight after being dried and then immersed in water for forty-eight (48) hours.

They must be set vertically on edge, in close contact with each other, in straight rows across the street, except at street intersections, which shall be paved at an angle of forty-five (45) degrees to the lines of intersecting streets, so as in no case to be parallel to the line of travel, and those in adjoining rows so set as to regularly break joints. No bats or broken bricks can can be used, except at curbs, where half bricks must be used to break joints. The brick having been set for a distance of sixty (60) feet, the first fifty (50) feet must be lightly rammed, after which a covering of bank sand, sufficient to fill the interstices, must be spread over the surface and broomed in, after which the whole must be rammed with a rammer weighing not less than fifty (50) pounds. A plank must be used under rammers. As soon as a square, not less than 100 feet in length and full width of the street, shall have been laid as above, a final covering of one-half (½) inch of bank sand must be spread over its entire surface. The surface of the finished street must be of the proper grade and form in accordance with the stakes of the city engineer

FOUNDATIONS OF PAVEMENT.

Sub-grade.—The street shall be graded down to a true crown, as per plan of, and stakes set by, the city engineer. The ground, after being dressed, shall be thoroughly tamped with an eighty (80) pound tamper, or rolled with a roller of 250 pounds or more weight per inch length of the roller, as may be required. All hollow places or other imperfections or old trenches, to be filled with earth and thoroughly compacted by tamping or otherwise, as in the future maintenance under this contract no allowance will be made for such defects. All soft or spongy material, wherever required, shall be replaced with gravel or broken stone at the contract price per cubic yard for said material. All surplus earth from the street shall be disposed of by the contractor at his own expense, unless required in the street improvement district in which the pavement is being constructed, in which case it shall be placed where directed by the city engineer, without extra charge by the contractor for over haul.

No earth shall be removed in the preparation of the sub-grade, below the base of ballast or concrete, and any earth taken out below such line may be required replaced with sand or gravel, without extra pay. In all places where any filling may be required, to bring the bed to the required height, it shall be done in layers not to exceed six inches in depth and thoroughly rolled or tamped to insure a solid bed. No allowance for extra grading will be made on any street that has ever been put to grade, except when a new grade has been subsequently established and not executed, when, as also upon ungraded streets, allowance will be made for what earth is above the curb level. No allowance will be made for any earth placed in embankment, upon the street being paved, except when the same is necessarily brought from some street or alley not under contract. In no case will extra pay be allowed for over haul.

Mr. Rosewater has reached the conclusion that the saturated soil of a clay base, being of a retentive nature, freezes and heaves up the concrete, which cracks unevenly, owing to the variable voids due to different sized stone in its composition, but there is no upward pressure from a gravel base providing sub-drainage and therefore free from freezing. In consequence, Mr. Rosewater provides for a sub-base of broken stone under the concrete to be laid on new pavements on clay or loam soils. He has also made several classifications of base with broken stone and binder without any concrete whatever. In addition he also proposes to leave a section nine inches wide on each side of the street, directly inside of and adjoining the curbs, of exclusively broken stone, to a depth of nine inches below the general base, to serve as a sub-drain, this to be connected at each of the sewer basins or inlets, so as to provide for a perpetual outlet for all moisture below the asphalt and its base.

Specifications for broken stone and concrete and curbing follow, and general stipulations regarding the contract, numbering nineteen paragraphs. The latter contains the provision that, "as a basis of interpretation of the acceptable condition of pavements at the expiration of the guarantee period, that if the paving material is sound and the wearing surface of the roadway shall possess no less than 75 per cent. in the thickness of the specified depth of the original paving material, in a smooth condition for travel, it shall be considered as

CLASSIFICATION.

For the purpose of bidding, the following classification has been adopted and will form a basis for bidders on all work herein referred to:

SHEET ASPHALTUM.

Class "A" No. 1.	Subbase broken stone or slag, three (3) inches, concrete base six (6) inches deep. Sheet Asphaltum wearing surface two and one-half (2½) inches deep, laid in two courses, the base a cushion coat of one-half (½) to inch, and top coat of two (2) inches thick.
Class "A" No. 2.	Subbase broken stone or slag, three (3) inches, concrete five (5) inches, asphaltic binder one and one-half (1½) inches, one layer of sheet asphaltum two (2) inches thick.
Class "A" No. 3.	Base broken stone or slag, twelve (12) inches, thick, asphaltic binder one and one-half (1½) inches, one layer of sheet asphaltum two (2) inches thick.
Class "B" No. 1.	Subbase of broken stone or slag, three (3) inches, concrete base five (5) inches, and one layer of sheet asphaltum two (2) inches thick.
Class "B" No. 2.	Subbase of broken stone or slag, three (3) inches, concrete four (4) inches, asphaltic binder one and one-half (1½) inches, sheet asphaltum in one layer one and one-half (1½) inches thick.
Class "B" No. 3.	Base broken stone or slag, eight (8) inches thick, asphaltic binder one and one-half (1½) inches, and one layer of sheet asphaltum one and one-half (1½) inches thick.
Class "C".....	For repairing over old concrete base, on top of old concrete sufficient broken stone or slag to raise the pavement to the required grade, upon this a layer of asphaltic binder one and one-half (1½) inches deep, and sheet asphaltum two (2) inches deep.
Class "D".....	For repairing over old concrete base, on top of old concrete sufficient broken stone or slag to raise the pavement to the required grade, upon this one and one-half (1½) inches of bituminous binder, then one layer of one and one-half (1½) inches of sheet asphaltum.
Class "E".....	For repairing only, sheet asphaltum wearing surface two and one-half (2½) inches deep, with base to be constructed as shown by plans and profiles on file in the office of the Board of Public Works.

BRICK.

Class "A" No. 1.	Brick to be of standard paving brick size, that is to say, substantially two (2) by four (4) by eight (8) inches in dimension. Base, concrete six (6) inches deep, sand or concrete one (1) inch deep.
Class "B" No. 1.	Brick standard size. Base four (4) inches of sand then one (1) course of brick two (2) inches thick with one (1) inch of sand on top of this.
Class "C".....	For repairing only. Brick, standard size, with base to be constructed as shown by approved plans and profiles on file in the office of the City Engineer.

STONE BLOCKS.

Class "A" No. 1.	Blocks, length, eight (8) to twelve (12) inches, width, three (3) to five (5) inches, depth, six (6) to six and one-half (6½) inches base, six (6) inches concrete and two (2) inches of sand.
Class "B" No. 1.	Blocks same as Class "A." Base, broken stone six (6) inches deep, sand two (2) inches deep.
Class "C".....	Blocks same as Class "A." Base, sand six (6) inches deep.
Class "D".....	For repairing only. Blocks five (5) inches deep, eight (8) to ten (10) inches in length and three (3) to five (5) inches in width, with base to be constructed as shown by plans and profiles on file in the office of the City Engineer.

DIFFERENT KINDS OF PAVEMENTS.

meeting the requirements for final acceptance."

The stipulations as to guarantees and repaving prices are as follows:

All pavements embraced in these specifications and bidding blanks are based upon a guarantee that the pavements will be well and substantially constructed as heretofore provided, and that such pavements will be maintained by the contractor in a condition of continuous good order and repair for the period of .... years from and after the date of their approved acceptance. All securities held as reserves, and accruing interests thereon, shall be subject to use for such maintenance and repairs by the city of Omaha, in the event of the failure of the contractor to keep

such pavements in proper condition, it being expressly understood and agreed that the board of public works and city engineer shall determine when repairs or reconstruction are necessary, and failure by the contractor to comply with their written order to enter upon such work within ten days and complete the same within a reasonable time shall be held as sufficient authority on the part of the city of Omaha to execute the work and draw upon the reserve fund to defray the expense thereof, or at the expense of the contractor and sureties, or both. At the expiration of .... years from the date of approved acceptance of the paving embraced in this contract, the contractor and sureties shall be released: *Provided*, That the city engineer and board of public works shall certify to the mayor and city council that the pavement is in good and proper condition at the time; and, *Provided, further*, That it shall be the duty of said contractor to notify the board of public works in writing within thirty (30) days prior to the expiration of the said .... years to inspect the work, and unless the contractor shall furnish such notice the obligation to maintain the said pavement in proper condition shall continue in force until such notice shall have been furnished and the final certificate of its good and proper condition shall have been issued as above provided.

It is distinctly understood and hereby agreed that all guaranteed pavements shall receive prompt attention in their maintenance, and when repairs shall fail to be made within twenty days of written notice from the board of public works, a charge of ten cents per square yard of the entire area within the block requiring repairs shall be made against the contractor for every month or fraction thereof that the repairs of said pavement shall be neglected. It shall be the duty of the contractor on making repairs in pursuance to written notice, to notify the board of public works when such repairs are completed.

The following prices per square yard will be paid by the city of Omaha for repaving cuts made in the pavement, by parties having first obtained a permit from said city of Omaha to cut or open the pavement of any of its streets:

On asphaltum, not to exceed the original price per square yard.

On all other pavements with concrete foundation, not to exceed $1.25 per square yard.

On pavements with a base of other material than concrete, 75 cents per square yard.

It is hereby expressly agreed by the contracting parties that the city shall, at all times, during and after completion of all work under this contract, and during the period embraced in the guarantee, have the right to cause the street to be opened, or issue permits for the opening of sections in the streets. The restoration of the pavement and its maintenance shall be done by and at the expense of the contractor at the prices stipulated for such work in the contract. In all instances where a permit shall be given to any person or corporation for the cutting open of a section of the street for street railway purposes, such work shall be done and its maintenance shall be carried on at the expense of the owners of such street railway, and the contractor shall be considered as relieved of the responsibility of maintaining such section of street as is thus opened and required by law to be maintained by such party during the balance of the period of the guarantee.

SPECIFICATIONS FOR CEMENT WALKS.

Replying to several inquiries that have been made in one form or another regarding the proper methods and materials to be used in the building of cement walks, the following suggestions are submitted as covering in a general way the whole subject.

Depending upon the character of the soil, climate and surroundings, the location of the walk is to be excavated to such a depth as may be necessary below grade, ten to eighteen inches, and the excavation filled and well rammed to within four or five inches of the surface of the proposed walk with broken stone or bricks, coarse gravel, cinders, or any similar material which will give a suitable base course. Walks at the foot of a terrace, or those subjected to seepage from soil upon higher grades, should be provided with suitable tile drains for their protection.

Wooden strips, four to six inches deep and about two inches wide, are then staked along the lines of

the walk and about tree spaces, where there is no stone curb. These must be carefully leveled and brought to grade to produce a good piece of work.

Upon the thoroughly compacted base, three or four inches of cement concrete and one inch of Portland cement mortar, covered by a thin, dry surface coat, are laid.

The cement in use should be the best quality of high-grade, slow-setting Portland cement, equal in quality to the best German brand. Several American Portland cements have given good results.

The sand should be a clean, sharp, rather coarse, concrete sand.

Either broken stone or coarse gravel may be used. The stone should pass a ring two inches in diameter.

The mortar for the concrete should be made of cement and sand in the proportion of one to two, thoroughly mixed dry, and then with a sufficient quantity of water to form a mortar which should not run, but should be rather dry and stiff. This will, of course, require much more working than the ordinary sloppy mortar. To this mortar the broken stone or gravel, or a mixture of the two, is added in such proportion as to leave a slight excess of mortar over that necessary to fill the voids in the stone. Four parts of stone to each part of cement will usually make a rich concrete, and often more can be used with a mixture of stone and gravel or with a graded gravel.

The stone or gravel should be sprinkled with water and drained before it is added to the mortar.

The mixing should be done upon a water-tight mortar board, the mortar being spread out as thin as possible, and the stone deposited upon it. The mass is then thrown up into the middle of the board, cut back and forth three or four times, when, if all the stone or gravel is well covered with mortar, it is ready to lay upon the base, where it is spread and rammed until free mortar appears on the surface. The base should, of course, be sprinkled, and the concrete should not be simply thrown off the shovel employed in moving it from the mixing board, but it should be deposited with a turn which brings the bottom of the shovel uppermost and allows the contents to drop at once in place without any separation of mortar and stone.

Blocks must then be marked off of the size required in the finished walk, and the joints deeply cut and filled with dry sand, or separated by tarred paper. They should be about three to six feet square, and and it is best not to vary from this rule and to avoid long blocks.

The mortar for surface should consist of equal parts of the specified Portland cement and sand, mixed rather dry. This should be spread to the depth of one inch upon the concrete previously laid, while the latter is still moist and fresh, and after the strips of wood at the edges of the walk have been releveled. It is well manipulated with wooden floats and brought to a true surface, when a small amount of water should appear. This floating or troweling should not be continued too long or cracks will be produced.

If a good surface is attained in this way nothing further need be done, but it is usually more satisfactory to have a slight excess of water on the surface and then to apply a dry coat, a dry mixture of equal parts of *fine* sand and cement to which some lampblack has been added as a coloring agent, at the rate of one pound or more to the

barrel of cement. This is dusted by hand upon the moist surface of the walk and carefully floated and tooled, which requires some skill, until a fine appearance is attained. No neat cement should be used as a dry coat, nor should the surface mixture be too dry before the application of the dry coat. Unless care is taken that each coat is fresh and moist before the addition of the following one, the pavement will not be monolithic and will not withstand frost.

The slabs, after the surface is finished, are rolled with a toothed brass roller, if desired, to within an inch of their edges, along which lines are drawn, or they may be left plain with beveled edges.

The pavement should be protected from the sun or cold weather until set, and should preferably be watered two or three times for the next few days to promote setting. It should be thoroughly cleaned also to prevent stains.

With four inches concrete and one inch surface, about eight pounds of cement is required for each square foot.—*The Brickbuilder.*

SAND CEMENT.

By Prof. Cecil B. Smith.

The engineering public is always interested in the improvement of cement. One of the most likely directions for such improvement at present seems to be the use of sand cement. Concrete is a mass of coarse stone or gravel whose interstices are filled with sand, which in turn has its interstices filled with cement. The finer we grind the cement the more completely is the surface of each sand grain covered with it, and the stronger the resulting mass. Now let us go one step further and we have sand cement. Let us take a mixture of say one to one of Portland cement and pure sand (silica sand), and re-grind this mixture into an impalpable powder, in which the cement gets ground very fine and the sand itself is as fine as ordinary cement. If we mix this sand cement in the proportion of say one sand cement to three ordinary sand, we obtain a mortar nearly as strong, and, indeed, some claim, fully as strong, as an ordinary mixture of one cement, three sand.

This process enables us to use less cement, and expend more on grinding. The relative costs are appreciably in favor of sand cement. A special application would be to haul a grinding mill to the site of large public works, where cement costs high by reason of freight; but where sand is plentiful, a large saving could be thus effected. Whether sand cement can be made and shipped in competition with ordinary cement remains yet to be demonstrated. In Denmark it has been made for two years, and cement works in Germany, Russia, Italy and the United States have commenced its manufacture.—*Canadian Engineer.*

THE QUESTION DEPARTMENT.

[By J. W. Howard, B. L., C. E., for MUNICIPAL ENGINEERING.]

ASPHALT PAVING OVER BLOCK PAVEMENTS.

Is New York city laying asphalt pavements over stone blocks? Several residence streets in Atlanta are now paved with Belgian blocks and there is great demand for improvement.

C. H., Atlanta, Ga.

New York city has used this system of repaving many miles of its streets for several years with success. The old stone pavements, although rough, are solid, and therefore make an excellent and durable foundation for asphalt pavements, especially when any one of the experienced companies does the work. This is generally the cheapest way to redeem such streets.

GENERAL PAVING ORDINANCE.

Where can I get a general outline for a city ordinance to regulate paving? I am one of a committee and hope to introduce some general ordinance to regulate the pavements and how they shall be laid and maintained in our city.

P. McG., Pottstown, Pa.

A general ordinance is not as practical as to adopt standard specifications for each kind of pavement to be used. These specifications in print can be had from almost all cities by addressing the city engineer or superintendent of streets. Other details are local questions which vary with each street. An ordinance preventing any one, except specially licensed persons, from cutting through the streets, is excellent for any city, especially if provision is made for the city employes or named companies or contractors to relay the pavements thus disturbed. More harm is done to our streets by cuts through them and bad repairs than by the wear of traffic. The proper consolidation of the earth replaced in a trench, etc., is best done with rammers, seldom by flushing with water, and good firm packing of the earth is the secret of successful repairs to pavements.

BERLIN STREET RAILS AND THEIR SETTING.

I have read a description of the street rails of Berlin, in which it is stated that the rails are set in concrete, without ties. Can you explain exactly how this is done, and also give the form of the rail?

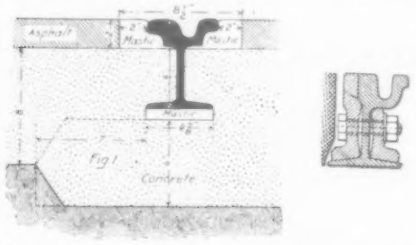
J. P. C., Consulting Eng., Boston, Mass.

From notes and sketches made in Europe, by one of our editors, we submit the following description. The illustrations, figures 2 and 3, are of a double line of street railway of general construction in Berlin. The concrete foundation is laid across the entire street, being thickened under the roadbed of the line of rails.

The street is first graded. The portion embraced by the street car line is graded about three inches deeper. The concrete is laid across the entire roadway. On the part, however, where the rails are to go, as well as between them, the upper surface of the concrete is finished at a level, the depth of the bottom of rails below the final surface of the pavement. RR denotes the rails; T the tie rod, which adjusts the width of the tracks; D is the beveled joint to prevent shocks. The fishplate at the joints, with six bolts, is indicated. The track being in place is aligned by means of small wooden wedges. Then the filling of mortar under the rails holds them up to grade. Mortar is filled in the webs of the rails on each side, as I in figure 3. This mortar is extended under the longitudinal cut granite stringers BB, which are from three to five feet long and placed against the rail. Then the concrete foundation is filled up to the proper level,

as at C. Also the adjacent concrete, as at E, figure 3, is brought up.

The construction on a granite paved street is somewhat similar, the rails being set on concrete, but the stringers are omitted. F indicates the thickness of the concrete



when the rails are first put together. AA indicates the finished asphalt pavement surface, which in Berlin is about two inches thick. The rails are of the grooved type, and about eight inches deep. No great variations from this size and form are allowed.

While the above has been for many years the standard construction, it was found to be very rigid, and the maintenance of the granite border stones difficult. Unless the street cars had very delicate springs, a rumbling disagreeable to the passengers was caused. After many trials, the advocates of a slightly elastic setting for rails have successfully introduced the system indicated in figure 1, from a sketch by L. H. Isaacs, C. E. It consists in setting the rail upon concrete as before, but with a layer five-eighths inch of special asphaltic mastic under it. On each side of the rail mastic is also laid about two inches deep and two inches wide. This mastic is composed of European asphaltic limestone combined with asphaltic cement and a little sand.

The asphalt pavement proper, in Berlin, is generally asphaltic limestone. This construction permits the rail to yield a little vertically, but so slightly that it can hardly be measured, nevertheless, sufficient to relieve the shocks which occur with rails set directly upon unyielding concrete.

The asphalt mastic at the surface, and on both sides of the rail, permits any injury caused by traffic to be quickly and cheaply repaired, which is not the case when the border stones BB, have to be replaced.

In the United States, where the asphaltic limestone pavements are little used, it is not necessary to introduce the asphaltic mastic along the rails, because the asphalt pavements here are compounded differently, and are more elastic than the rock asphalt or asphaltic limestone pavements of Europe.

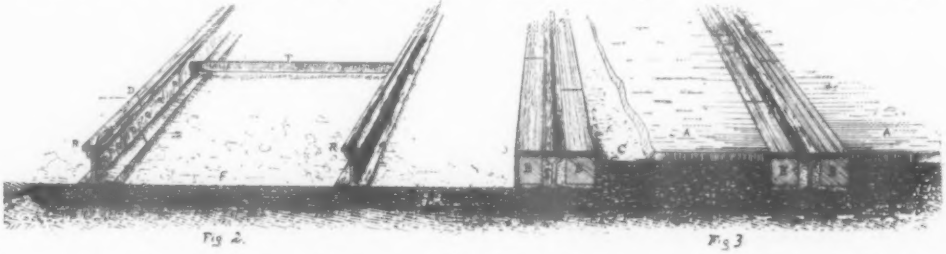


Fig 2. Fig 3

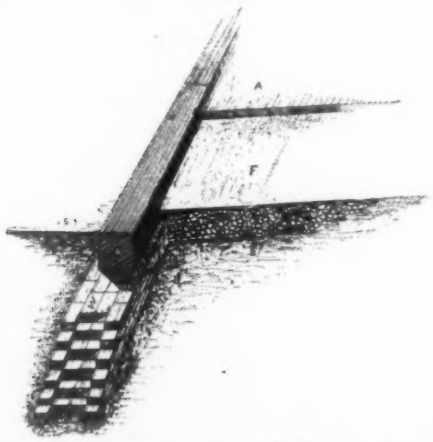
Therefore, in the United States, experience has shown that it is best to lay our asphalt pavements directly against the rail, provided the rail is firmly set. It should be remarked that rails set on wooden cross-ties, without concrete, are generally yielding, but if the concrete, under the asphalt, is closed in about the rails, they become firm and can yield a little,

due to the wooden cross-ties. However, as to the permanency of such structure with wooden ties, the future will best answer.

FIRM SETTING FOR A BROAD-FACED CURB.

Curbs in our soil, subjected to frost, must be at least 18 to 20 inches deep, so as not to be forced upwards or sideways, which has occurred to many curb-stones here in Troy. Is there any way of setting a broad-faced curb of 6 or 8 inches across, so that it will not be displaced by frost, without being compelled to purchase curb-stones 20 inches deep, which, if of such thickness, are very expensive? *X., Troy, N. Y.*

The following cut is taken from a sketch made by the writer of a broad-faced granite curb nicely cut and firmly set upon a brick foundation. The depth of the brick foundation varies with the kind of soil. The curb is thus firmly held in place, after being imbedded in



mortar upon the foundation. Very cheap bricks are suitable, as they are entirely underground. This brick wall is easily extended out to the curb line. C is curb; W, foundation wall; S, sidewalk; E, earth; T, concrete foundation; A, pavement suface. Curb-stones, 8 by 8 inches, or similar dimensions, are far cheaper than even the thin, deep ones. The bricks are laid with the cheapest kind of mortar, as they are held firmly in place by the neighboring soil. Another method of setting square curb, which is by inclosing it in concrete, is illustrated in MUNICIPAL ENGINEERING, Vol. 10, p. 402.

VARIOUS COSTS OF MACADAM ROADS.

We are agitating road improvements in South Carolina. The question on which we are not agreed is cost. Upon this there is the greatest diversity of opinion. The discussion has been confined to macadamizing, and the engineers have estimated the average cost of a six-inch macadam roadway at about 65 cents per square yard. Enthusiastic advocates place it as low as 11½ cents per square yard, and quote fully from reports of work accomplished in other states and partly from the Department of Agriculture, Division of Road Inquiry, Washington. Of course, it is impossible to consider these figures intelligently without knowing more about the details of construction in each case. The great difference in cost is doubtless due to the difference in the quality of the road.

General Stone is quoted as saying, "Some of the very best roads in the United States are now being built for $1,000 per mile," a figure which seems incredibly low. If you have the statistics, will you give me the cost per square yard of macadamizing in several states, giving as far as you can the character of the work in each case?

Chas. C. Wilson, City Eng.,
Columbia, S. C.

From the records of the Division of Road Inquiry, which you mention, we fail to learn that General Stone has made such a statement. The lowest estimate he gives is for "macadam roads in Morris county, N. J., from $2,000 to $2,500 per mile." Your letter answers in large part your question. Generalities predominate in reports of the Department of Agriculture. Some special cases are given:

"From eight to nine feet of macadam about six or eight inches thick has been laid through the center of well constructed earth roads in Michigan, North Carolina, Ohio, Georgia and Canandaigua, N. Y., for $900 per mile." This does not include more than the simple macadamizing of the

narrow single roadway in the center. Honest administration, cheap labor and stone, available in the neighborhood, are needed. The estimated cost, with convict labor, for narrow macadam roadways in New York state is $800 per mile.

The elements of the cost of a macadam road are so numerous and variable that cost is always a local question which depends upon the cost of labor, superintendence, transportation, tools, machinery, character of stone, hard or soft, durable or not, drainage of roadbed, very expensive at some points, rains, wind, snows, frost, maintenance of road (for if but six or eight inches thick constant maintenance is necessary), system of repairs, whether done by a few men giving constant attention over the whole, or done by gangs of men at long intervals; in fact, cost depends upon exactly what is meant or defined by a macadam road, width, depth, time of construction, and how drained.

The macadam roads of New Jersey are ten or twelve feet wide and at least eight inches thick, and cost $7,000 and more per mile, but the maintenance per mile per year is reduced to about $40. In Massachusetts, where loose stone was poured on the ground and lightly rolled to save first cost, the subsequent maintenance is often $70 per mile per year. In this connection see Vol. 10, page 194; Vol. 11, page 154; Vol. 13, page 33.

Judging from our knowledge of South Carolina, and approximating the cost of certain details above indicated, we think 65 cents per square yard should make a good macadam road in most parts of your state, nine feet wide, eight inches thick and consolidated by steam-roller. This would include grading and proper drainage. The cost would be about $3,432 per mile. The maintenance of it by the block system, a few men constantly at work under one general supervising engineer, should not cost more than $40 per mile per year over several hundred miles of roads.

NEW YORK CITY BICYCLE ORDINANCE.

What are the terms of the New York City bicycle ordinance, mention of which we so often hear?

H. C. Masterson, Cincinnati, Ohio.

The ordinance is long, but the following are the principal points: Cyclists on avenues and boulevards have right of way over cross streets. Ambulance, police and fire department wagons always have right of way. Any vehicle or bicycle overtaking another shall pass on the left. Any overtaken vehicle or bicycle must keep to the right. No bicycle shall stop on the street, except near the curb. No vehicle shall turn from the curb until the driver or rider shall have given a signal to be plainly seen from the rear. Every vehicle, or motor-wagon, must carry an alarm bell not less than 1½ nor more than 3 inches in diameter, to be sounded when turning corners, or when about to pass another vehicle or equestrian from behind. No bicycle shall travel at more than eight miles an hour. All vehicles must keep to the right of the center of the roadway in the direction they proceed. No more than two bicycles shall be ridden abreast. No cyclist shall coast on any streets. Every bicycle, from one hour after sunset to one hour before sunrise, shall have a light or lights visible from the front and side for at least 200 feet. No vehicle or bicycle must turn a corner at a greater speed than three miles

an hour. No cyclist shall carry on a wheel a child under five years of age. No one shall ride a bicycle on any sidewalk. Cyclists may push their wheels in single file along sidewalks.

FORMULA FOR ASPHALT PAVEMENT MIXTURES.

In fairness to asphalt paving contractors who are compelled to guarantee their work for a long term of years, should the exact terms of the formula be determined by the city engineer alone?

H. N. Francis, Providence, R. I.

The remainder of your question gave special instances and illustrations not necessary to publish. No city engineer can have such detailed experience as to be able to determine the exact formula to be used for asphalt pavements, and one suitable to every street. The best he can do is to investigate carefully, and state the maximum and minimum limits of the different quantities of the different materials to be used in the pavement. He can also name certain tests of temperatures, density, etc., of the asphaltum and residuum oil, etc., as well as certain general requirements for the sand, limestone, or other dust to be used.

It is perfectly proper for the city engineer to obtain the exact mixture, temperature, etc., used in compounding asphalt pavements under his charge, but not best that he should direct these details too closely, because the mixtures vary with the kind of sand and asphalt used, as well as with the conditions found in different streets of the same city. If a pavement should fail, and a contractor should prove that the city engineer had detected mixtures other than those which the contractor desired to use, the result would probably be one for lawyers. The city engineer is called upon to throw every safeguard around the city's interests, but can not be expected to specify the exact formula, temperature, methods, etc., to be used in compounding asphalt pavement.

CHICAGO DRAINAGE CANAL AND ITS INFLUENCE.

Will the new Chicago drainage canal, when finished, entirely relieve Lake Michigan of sewage from the city of Chicago? Will typhoid fever be reduced to normal limits? Will the level of the lake go down, and, incidentally, will Niagara Falls be affected by loss of water?

A. P. Bell, Chicago, Ill.

It will not remove all sewage until intercepting or collecting sewers are constructed through certain districts of the city, to conduct the sewage to the drainage canal. It, therefore, will do so in time, but not at once.

As to typhoid fever reduced to normal limits, this will naturally follow in proportion as the lake water is purified. It may take some time after all the sewage has ceased to flow into the lake, possibly a year, depending upon what directions the new currents will take, caused by the drainage canal drawing off the lake water, and whether or not the water will become pure in the neighborhood of the several intakes for drinking water in the lake.

The level of the lake will fall very slightly. This will be controlled, however, so that it may not exceed a few inches. A government commission has this matter in charge, and its final report is not yet available as far as we have been able to learn.

Niagara Falls is estimated to carry an average of 180,000,000 cubic feet of water per minute, and the Chicago drainage canal, from the best data obtainable, can carry 6,000,000 cubic feet per minute. Close observers with instruments

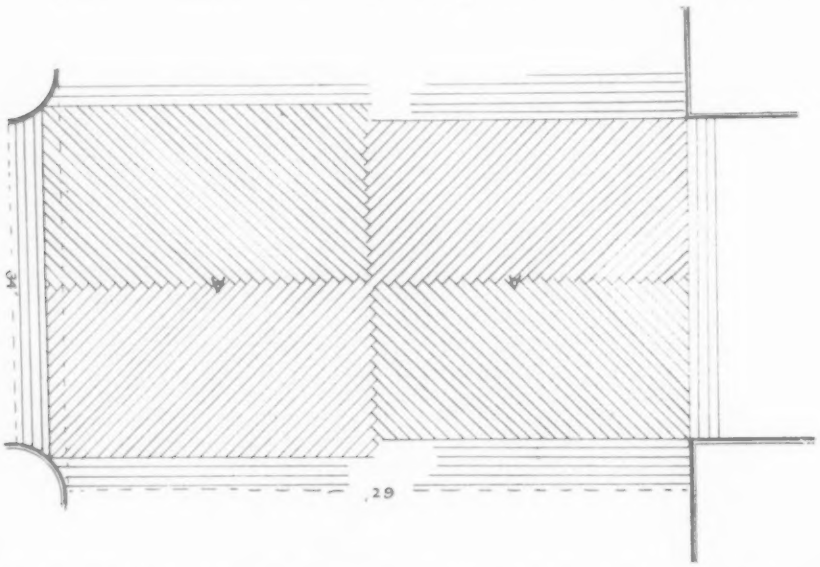
and comparison of records will show a slight lessening of flow of water over the falls, but the eye of an ordinary observer could not perceive it, for the reduction theoretically will be a loss of one-thirtieth of the former flow.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

HOW TO CONSTRUCT THE HERRING-BONE FORM OF STREET INTERSECTION.

I would like to know where to commence and how to construct the "herring-bone" of an intersection that is 67 feet across the main street and 34 feet across the intersecting street. *H.*

The accompanying sketch will show the ordinary forms of such an intersection. Perhaps as convenient a place to begin as any is at the point marked A in the



sketch, which is at the intersection of two lines from the intersections of the curb lines, which are at right angles to each other at the point A. By working each way from this line there will probably be less adjustment necessary at the lines of junction with the other sections of pavement than in any other way. In this case it will be noted that the point A is in the center line of the cross street and 17 feet from the curb line of the main street. The distance from A to the center of the main street is 16½ feet. When the corners of the curb lines are rounded as shown on the right hand side of the sketch the distance from A to the straight brick on the cross street will be more than 17 feet by a distance depending on the radius of the curved corner. The herring-bone section is wider in the main street also, by the same amount. If there is little travel in the narrow street which will cross the main street, the herring-bone section may be omitted, or the diagonal lines may run all in one section instead of the four sections shown in the sketch, thus saving any trouble of adjustment anywhere but along the outside edges, or the diagonals may run in two sections with the center line of the main street as the dividing line, or

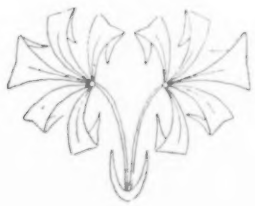
with the center line of the cross street as the dividing line. The former is the better of these under most conditions of travel, if the diagonals are placed so that the heaviest traffic crosses them. Thus in the figure, if the upper side is the side from which the most traffic comes the diagonals as laid out in the upper half of the intersection would be in the proper direction. If the traffic to and from the cross section is appreciable, the form in the figure is preferred. If a gutter of special form is provided for the area of the herring-bone section may be decreased in a similar manner to the increase shown for round corners.

SPECIFICATIONS FOR A FIRE-PROOF VAULT.

I want to prepare specifications for a fire-proof vault, inside six feet by twelve feet, to be built on rear of second story brick building.

H. M. Minton, Carlinville, Ill.

Two eight-inch walls well laid, with a two-inch air space between them, make a sufficient fire-proof vault for ordinary cases. One of several stories height should have the outer wall thickened in the lower stories as the height increases. If there is danger of a hot and long-continued fire the vault will be safer if the walls are made thicker, and possibly in some cases even fire brick may be desirable. Cement mortar is an improvement. One or more layers of asbestos may be used instead of the air space and the walls thus brought close together to aid each other more in carrying the loads above. The horizontal divisions between stories should be brick arches. The proposed second story vault should be supported directly on brick walls sixteen inches thick and the floor should be supported by a brick arch, similarly constructed to the walls of the vault. Steel beams can not be used as supports for any part of the weight, unless they are fully protected from the action of the fire by adequate fire-proofing.



BY WAY OF COMMENT.

Los Angeles Water Supply Question.

The city of Los Angeles granted in 1868 a thirty-year franchise for waterworks, the water, all but ten "inches," to be obtained from underground sources. The ten miners' inches of water mentioned could be taken from the Los Angeles river. The city paid $1,500 a year, and the company received the exclusive right to lay water mains in the streets, and was required to place a hydrant at each street corner which was passed by the pipes, and to erect an ornamental fountain. The company could not be required to lay pipes on streets unless enough water consumers, to guarantee 10 per cent. interest on the cost of the mains, were secured before construction. The company was restricted to domestic water supply, and could not furnish water for irrigation.

The company seems to have fulfilled the contract, except that about 1,900 "inches" of water are now taken from the river instead of the ten inches authorized. The system is not, however, satisfactory in several particulars; for example, about 55 per cent. of the total mileage of pipe is two inches in diameter, and over 78 per cent. is four inches and less in diameter. This, in any system, and certainly in a system of nearly 320 miles of pipe, is evidence of inadequency for fire protection. In addition, about 68 per cent. of the pipe is wrought iron, a material which is not suited to the local conditions of soil and water. The plant for collecting water has grown up as immediate requirements have demanded and is badly scattered, some portions having outlived their usefulness. The company can not be required under its contract to bring the plant up to modern requirements. As the end of the franchise period approaches, therefore, there is much discussion of the subject of purchase of the works by the city. A method of ascertaining the value of the improvements by means of appraisers was inserted in the original contract.

At the request of the city council the city engineer has made a report, giving in detail his answers to four questions propounded and the reasons therefor. The water company has furnished a schedule of the property, and the first question is as to the accuracy of the statement.

In general, the accuracy of the schedule is affirmed, the only material variations being a discrepancy of thirty-five miles in the length of pipe given by the water company's schedule and that entered on the water company's maps as being in use. About $12,000 worth of real estate is considered as not necessary to the operation of the water plant and some of the appurtenances are shown to be beyond their period of usefulness. The report goes into detail regarding the condition of the property, the general conclusion being that the cast-iron pipe is good and

the wrought-iron and steel pipe, with the exception of the new large conduit, is in bad condition, the difference between the value of the pipe system when new and in its present condition being about $170,000. The deterioration on the remainder of the plant is about $40,000. There are but 535 fire hydrants in the system, or about three to five miles of pipe. The other questions asked are the cost of a new plant identical in all respects with the present plant; the present real worth of the plant; and its available value to the city as a part of a complete plant. The city engineer's estimate of the cost of duplicating the plant is $1,432,242, and its present value is placed at $1,203,250. The portion of this plant of some value to the city in constructing a complete plant is valued at $1,190,600. Details of the figures on which these estimates are based are not given in full. The engineer proposes two methods of procedure by the city, both of which propose the payment of $1,190,600 to the water company for the plant. The cost of a complete plant is estimated at $3,490,600, the new portion costing $2,300,000. The first proposition is to issue $3,500,000 bonds, at 4½ per cent. interest, and construct the works as rapidly as possible. The annual expense, including interest, would then be $328,000. A reduction of rates is proposed which, on the basis of present consumption, would bring in $340,000, leaving a surplus of $12,000 a year. The plant seems to be considered as permanently complete and no amount is included for extensions, the expenses being interest and sinking fund, running expenses and renewals.

The other plan proposes an expenditure of about $620,000 for new work at the beginning, requiring the issuing of $1,800,000 of bonds. The interest, sinking fund and running expenses in this case, would amount to $189,000, leaving $151,000 to be expended on renewals and extensions, which, with resonable reserves, would complete the plant in about twelve and a half years.

The case in Los Angeles is somewhat different from the cases in Kansas City, Omaha, Syracuse, and other places, where municipal ownership has been discussed recently, for the reason that the original franchise was for a definite period, which is now about expired, and states in definite terms that the company at the end of the period will return the waterworks to the city in good order and condition, reasonable wear and the damage of the elements excepted, upon the payments to them of the value of the improvements made after the contract is entered into, and that the city will accept the works and make such payments, the amounts to be ascertained, in case the parties can not agree, by three appraisers.

The report of the city engineer is the first full step towards the completion of the terms of the contract. The terms of the original con-

tract seem, from the report, to be practically unchanged in this regard, notwithstanding the great change in conditions since they were first determined upon. The economy to the city of a purchase of the works is obvious, and the difficulty of securing a reasonably adequate service from the company without making concessions which would be quite burdensome is as clearly seen. It should not be difficult for the city and the water company to agree upon the value of the improvements under the present conditions.

Mechanical Filtration of Water.

The report on the experiments at St. Louis on the mechanical filtration of water, a portion of which was published in the last number of MUNICIPAL ENGINEERING, is a valuable addition to our experience in this line. By the term mechanical filtration is usually meant the removal of impurities from the water, by the addition of a coagulant of some sort, and a subsequent filtration of the water at a rapid rate under pressure through a bed of sand. The term is doubtless derived from the "machine" in which the operation is conducted and distinguishes the process from that of natural filtration, the passage of water at a low rate through an open bed of sand with a small depth of water on the bed, and no addition of chemicals. Each system has had its periods of special popularity on account of important successes in the treatment of water under the conditions of particular localities, and now the trend of opinion is to the effect that each has its special field, and that each municipality must decide upon the method of water purification after a careful consideration of the local conditions.

The efficiency of the natural method apparently depends upon the formation of a film of finely divided matter, largely organic, upon the surface, which effectually screens very small particles of suspended matter from the water; upon the action of bacteria which consume the organic matter remaining in the water; and upon some peculiar interaction of the bacteria and the sand bed, whereby the suspended matter, including bacteria, is practically all removed. Evidently if the film can not be formed, or it too readily becomes impervious to the passage of water, under the low head of the natural system, the filter is not a success. The addition of the coagulant hastens the formation of the film and also hastens the period of imperviousness, so that the higher pressure of the mechanical system is necessary to continue the action of the filter for a reasonable length of time.

When the impurities in the water are largely organic the film forms readily on the open beds and the process is successful without coagulants, but when the impurities in the water are very finely divided inorganic matter with a very small proportion of organic matter, the

film does not form readily and the interior of the sand bed is filled with the clay and sand from the water before the filter begins to have its full action. Its period of full usefulness before cleaning is therefore short. This is the case in St. Louis and the natural method of filtration fails of complete success upon a practical scale. The mechanical method is successful in clarifying the water, and the report of the chemist has shown that the coagulant added can be so regulated as to quantity that there will be no excess of the chemical to pass through into the filtered water supply.

During the year 1893 an elaborate series of experiments upon the mechanical filtration of water was carried through by Edmund B. Weston, C. E., at the Pettaconset pumping station of the water-works of Providence, R. I. The results of this investigation were printed last year and were the first presented upon a large scale and by unbiased observers. These experiments show in general similar results to those attained at St. Louis. The Providence water supply has not the finely divided clay which is a characteristic of the St. Louis supply, but has a larger amount of organic impurity.

In St. Louis the application of the coagulant produces an immediate coagulation and precipitation, which will rapidly prepare a filter for use. In Providence the amount of matter which can be coagulated is usually so much less that the application of the coagulant directly to the water does not produce sufficient action to form quickly the film on the surface of the bed, and the organic matter, as measured by the percentage of bacteria removed, is not completely removed for one to three hours after the process begins, and the use of three-fourths of a grain of sulphate of alumina per gallon of applied water is necessary. If, however, about a pint of coagulant containing 911 grains of the sulphate of alumina for a rate of filtration of 128,000,000 gallons a day per acre of filter area is added in the first six minutes, the film forms and the filter is in full action in a half-hour or less, and the amount of coagulant regularly applied thereafter is but one-half grain per gallon.

The best chemical for use with the Providence water was found to be basic sulphate of alumina containing 16 to 18 per cent. of alumina in the average proportion of 0.6 grain per gallon or one part in 87,500. In St. Louis the same chemical is used in a proportion of one in 20,000 to one in 100,000 by weight, according to the amount of matter in suspension.

The determination of the exact amount of alumina in the applied water is very difficult, if not impossible, but the fact of its presence can be ascertained. Different methods were used at the two places. In Providence it was thought that no basic sulphate of alumina was found in the water after a clean filter had been in action for twenty-one minutes; and in

St. Louis it was found that the proportion of sulphate of alumina could be increased to about 1 in 4,000, or even 1 in 3,000, before it would show in the filtered water. So far as the chemical methods used are reliable, therefore, it is evident that the amount of the sulphate of alumina necessary to coagulate the impurities is far below the limit of its appearance in the filtrate.

The rate of filtration at Providence for successful results, varies from 90,000,000 to 193,000,000 gallons per twenty-four hours per acre of filter area, the average being 128,000,000 gallons and the rate for computation of required filter areas being recommended to be taken as 100,000,000 gallons. The result of this filtration was considered equal to that through the best constructed sand filter beds at the rate of 2,000,000 to 3,000,000 gallons per twenty-four hours per acre. Sand filters were run beside the mechanical filters during a large part of the tests for comparison. The rate of filtration at St. Louis is not stated, but it doubtless varies considerably, for the condition of the water varies between wide limits. It is to be expected that the average rate will be less than at Providence.

The mechanical filter used in the Providence experiments removed as an average, 98.6 per cent. of the bacteria in the applied water.

The Providence experiments also took up many points of the mechanical operation of the filters, which will not be considered here.

The cost of operating a 15,000,000-gallon plant is estimated by Mr. Weston at $4.52 to $5.69 a million gallons, according to methods of cleaning used, and if interest on cost and deterioration are added to the first figure the cost will be $7.67 a million gallons. Mr. Holman, of St. Louis, estimates the cost of operation at $10 a million gallons. The cost of cleaning will doubtless be greater in St. Louis, and justifies the larger figure for operation.

The report upon the elaborate experiments at Louisville last year is awaited with much interest. It should increase our stock of information very materially.

Sewer Assessments.

The question of assessments to cover the cost of constructing sewers has been discussed in Fall River, Mass., and a committee composed of the mayor, city solicitor and city engineer has prepared a report on the subject and an ordinance prescribing the method of levying the assessments.

The ordinance is given on another page, as it presents some new combinations of methods which are quite interesting.

The report sets forth the laws of the state under which assessments must be made, and shows that the city must pay a proportion of the cost not less than one-fourth nor more than two-thirds of the estimated cost of the sewer; that

every person whose drain enters a sewer must pay his proportion of the cost of construction and of maintenance; that owners of estates may be assessed by frontage or area or both for sewers in the district; that the use of the sewers may be rented; and that any or all of these methods of covering the cost may be used. A tax on frontage alone is unfair, for some large estates have small frontage; one on areas is unfair, for the large area may be unimproved and so not need the sewers, while the small estate may be fully improved and has full use of them; and one based on both area and frontage is objectionable for the same reason. The rental plan is not equitable, for the large unimproved estate then fails to pay for the enhancement of its value on account of the adjoining sewers. A combination of the methods is therefore recommended.

Thirty years is taken as the time necessary to complete the system and its cost is estimated at $3,150,000. Of this amount one-third, $1,050,000, it is proposed to raise by assessments in the thirty years. Of this one-third (one-ninth of the whole cost) or $350,000, will be raised by a combined area and frontage tax, more being assessed to area than to frontage. The other two-thirds or $700,000 will be raised by rentals. The direct assessments can be paid in ten annual payments if property owners so elect. The estimated income from rentals the first year is $32,000. Two-thirds of the entire cost, or $2,100,000 will be paid by general tax.

The ordinance gives the details of the method of assessment and is notable as fixing the exact amounts which shall be raised by each method of taxation, so that when the sewers are paid for the payments of rental, as well as of direct assessment, will presumably cease. The city can legally pay no more than two-thirds of the total cost, so that if the estimate is too low, a new assessment must be made to raise one-third of the excess of cost. The assessments of 15 cents a linear foot of frontage and of 3 mills a square foot are evidently based upon a close estimate of the length and area of property abutting on the proposed sewers.

The schedule of rental charges is interesting as making the charge two-fifths of the water rental, with a minimum charge of $8. This seems like a large amount to pay, and will deter many persons from making connection. It can scarcely be less, however, to raise the amount apportioned to this class of taxes. While it is theoretically correct to assess on the persons directly benefited a large proportion of the tax, it is practically incorrect to make an assessment for sewers depend upon the fact of making connection. The greatest possible encouragement should be given to property owners to connect with the sewers. It is difficult enough to get the greatest offenders against the good odor of the town to make

any move towards cleaning up without forcing them to pay for the privilege in addition. In some cities the cost of house branches from the sewer to the curb, or even to the property line, is made a part of the cost of the sewer and assessed as such, to make the trouble and expense of making connection as slight as possible. When the assessment is so made that the person in question must pay whether he uses the sewer or not he is more likely to make connection, that he may have something to show for his money.

Nashville Meeting of A. S. M. I. The time and place of the meeting of the American Society of Municipal Improvements, at Nashville, in October, are well chosen so far as external pleasure are concerned. October is a wonderful month in that latitude; and the Exposition is a very great attraction. But little is known as yet of the arrangements for program. The committee on pavements is doing its share of preparation and there are some signs of life in the committee on city government. These meetings can be made of great value if all who attend them are willing to give their share of instruction and entertainment. The full interchange of opinions and experiences in a spirit of co-operation will make the meeting of interest. There are two rocks upon which readers of papers and speakers are likely to steer: on the one side, they will spend time in describing details which are common to all work of the kind, and, on the other hand, they will omit the new ideas or peculiar constructions because familiar to them and so presumably to others. Some investigation of the methods of others and care in selecting material will prevent either of these disasters.

What Constitutes Repair of Pavement. The cities of Omaha and Lincoln, Nebraska, were given new charters by the legislature last winter, one provision of each of which is that no paving or repaving of a street can be done until a large proportion of the property owners have signed a petition, asking for the work. In Omaha the proportion required is different in the central portion of the city from that in other districts. In Lincoln, three-fifths of the owners of property on the street must sign the petition. The city can repair a pavement at any time that the proper officials decide, the cost being paid from a fund raised by a general tax of not more than four mills annually upon each dollar of valuation. The surface of many of the wooden block streets in Lincoln is rapidly becoming too rough for travel, and petitions for repaving are not frequent. The foundations for the pavements are usually concrete.

The question is now raised whether the replacing of the block surface by an entire new covering would be considered as repairing or as repaving. Some are desirous of believing that even if the wooden blocks are replaced with brick the

operation can be classed as repairing the pavement. If it can, the city could replace all the block pavements in about ten years provided no other use was made of the repair money and the entire levy authorized were made each year. It is hardly probable that the courts would uphold this construction of the law, and the people who desire to see the improvement of the city go on must go to the next legislature for relief. A similar law went into effect in Illinois July 1st, and is already beginning to be felt.

Cracking of Asphalt.

City Engineers Rosewater, of Omaha, and Thompson, of Peoria, seem to differ widely in their opinions of the reason for the cracking of asphalt. Mr. Rosewater has come to the conclusion that the character of the subsoil has much to do with the matter of cracks in the surface of the pavement.

He thinks that if the subsoil is clay and not well drained, the action of the weather upon the pavement, especially of frost, will be to heave the soil, and crack the foundation and the pavement. When the subsoil is sand and is well drained, he does not find this difficulty. Most of the soil in Omaha is clay and there are many cracked pavements there. The soil in Denver is sand and there are few cracked pavements. Many of the pavements in the two cities have been laid by the same paving companies. Mr. Rosewater has modified the specifications for street construction to include a strip of broken stone along the curb line, which is to be nine inches deep below the regular concrete base. He is reported to be considering favorably the abandonment of concrete as a foundation for asphalt pavements, proposing to depend upon a greater depth of broken stone. It is to be presumed that he has made provision for draining the water from the trenches of broken stone.

One example which Mr. Rosewater cites is in Peoria, Ill. Here the asphalt on the West Bluff, with clay subsoil, is cracked, while the asphalt down town, with sand subsoil, is not so seriously cracked.

Mr. Thompson states that his continued observation of Peoria pavements leads to a very different conclusion. He finds that the condition of the asphalt, when laid, is of much more importance than the nature of the soil beneath the concrete base. He has experimented upon the variation in the proportion of asphalt in the pavement, and finds that when the asphalt is laid stiff and hard it lacks its full power of cohesion and cracks under extreme cold, as on the West Bluff. A softer mixture will follow the variations of temperature without cracking, the material being more elastic.

It is not easy to see the steps by which Mr. Rosewater reaches his conclusions. It is certainly true that a wet subsoil subjected to a sufficient degree of cold would heave the pavement and break both concrete and asphalt. It may, therefore, be quite necessary to

provide for subsoil drainage in clay, especially if the streets are flat. This is done very successfully in Muncie, Ind., for example, by means of tile drains at the bottom of trenches filled with broken stone, the drains discharging into the nearest catch basin or sewer. Such heaving as would occur in an undrained street of this sort would very soon disintegrate the pavement entirely, for it would show not merely in cracks on the surface but in irregular settlement after the frost had left the ground, as well as in irregular swelling of the pavement under the action of the frost.

In Omaha it is hard to believe that such an action occurs, for the subsoil water is nearly everywhere a long distance below the surface; the street gradients are anything but flat; the arrangements for keeping water from draining to the subsoil under the pavement are fairly good; and while the soil is clayey, it is, in its natural state, exceedingly porous, so that special treatment by thorough puddling is necessary to make it hold water. The probabilities are very great, therefore, that there is seldom any serious amount of water under a pavement there. Close observation of the nature of the cracks shows that there are none which could be considered as caused by such upheavals by frost as would break the concrete, and with a few exceptions in areas with wet subsoil there is no such unevenness of surface as would result from even slight upheavals of the concrete. It is not to be denied that there are a few spots which give color to a theory of frost action, but they are so few and small in proportion to the number and area of cracked streets which are beyond the reach of such frost action, that they can not be used as a basis for a theory that this is the general cause of cracks in asphalt streets. A street in Indianapolis is called to mind which in April was full of cracks and was placed on the list for repairs. In June, after two months of warm weather and reasonably heavy travel, the fine cracks had disappeared entirely and the larger cracks had nearly closed. One block of a street in Detroit, having no outlet at one end, was observed to be much cracked, while other blocks of the same age adjoining were in good condition. The end block had no travel upon it; the others had considerable. There was no visible disturbance of the surface in either case. It is believed that a census of the opinions of expert observers would show that most of them attribute the cracks to stiff mixtures and light travel, with a very few exceptional instances of heaving by frost. Unquestionably, however, the drains provided by Mr. Rosewater will protect the pavements from any possible detrimental action of the water, not only by draining the water from under the pavement, but even more by leading off water from outside which might otherwise find its way under the pavement.

Observation of pavements laid on broken stone in Columbus, O., and elsewhere, shows that heaving or unequal settlement has more effect upon such constructions than it has upon pavements with concrete foundations. Detrimental conditions enter which more than offset the slight advantage of good drainage. It is almost always the protection of the pavement from outside water which is needed. This is MacAdam's principle, which is applicable here as well as to the road bearing his name.

The Use of Water Meters.

The unsuccessful attempt to remove the water meters from the Detroit system and the successful attempt to remove them from the system in Savannah, Ga., have given rise to much interesting discussion on the subject. The reasons for the proposed change at Detroit are discussed in our last issue and in some preceding. The basis for the agitation in Savannah seems to have been that the use of meters tends to restrict the legitimate use, leading to filth and nurseries for possible yellow fever, and that meters are inaccurate. The latter charge may be dismissed as a matter of detail in management. The former has been refuted so often that it is not possible to say anything new on the subject; but there are too few cities with a meter system to remain entirely silent. The fact is that a properly prepared schedule of water rates has no effect upon the legitimate use of water, but performs only its office of restricting waste.

When charges are made for each faucet or other connection the poorer class of houses and tenement-houses are very likely to have but one yard hydrant in common use by several families, whose use of water is thereby restricted to a minimum. This is true even when an additional charge is made for each additional family, for this charge is almost never equal to that for a new hydrant. A meter rate whose minimum allows a liberal amount of water for each family, with extra charges when more than one family has the use of a hydrant, would be an inducement to put in separate connections for each apartment, to get rid of the extra charges and to make it possible to hold each tenant responsible for his own waste. A large allowance for legitimate uses, say even forty or fifty gallons a day for each person in the family, as a minimum charge does not restrict such legitimate use, but increases it in the many cases of people who will get all they have paid for whether they really think they need it or not. It will diminish, for example, the inordinate waste of people with similarly constituted minds who care for nothing but the fact that they have paid money for the unlimited use of water and so will let it run whether needed or not, and of leakage through broken pipes and defective fixtures for the repair of which money must be paid, while under the flat

rate system the leaking water need not be paid for.

The American people have had the idea that water must be as free as air, and any restriction of its waste is a restriction of a God-given privilege. This is at the bottom of the arguments of many of the Detroit agitators for free water. The injustice of the application of the principle to the cases of manufacturers, is well shown by the Detroit officials. The injustice to the law-abiding, careful citizen, mindful of the rights of others, who must pay for the wanton and criminal waste of his neighbors, is enormous, to say nothing of the vast expenditure of money that would be necessary to supply the demand.

To how many persons in the world is water as free as air? Almost no one who lives in or outside of civilization can get water for his sufficient and convenient use without pump, or windmill, or dam, or pipe to convey it, for all which he must pay in labor or in money. What the citizen pays for is not the water, but the collection and the carriage of the water to his room. The charges must be in proportion to the cost, just as they are when he draws from a well and carries water or fills a tank by hand, horse, steam or wind power, to serve his house alone. There is no conceivable reason why he should not pay the cost in one case as well as in theother. There is also no conceivable reason why he should pay for the carriage of water for his neighbor, except as an act of charity or friendliness, especially when that neighbor is wantonly wasting the water it costs so much to bring to him. A system of charges by which each householder will pay his own bill for water-carriage, is therefore demanded, the minimum charge being so regulated as not to restrict legitimate use of water. The demand for such a system is growing from year to year, notwithstanding an occasional backward step in some locality.

Hudson River Tunnel. There is some prospect that the tunnel from New York to New Jersey, under the Hudson river, will be completed. The tunnel was started about twenty-three years ago, and has had two or three periods of inactivity on account of failures to raise sufficient funds. The projector was D. C. Haskin, who was responsible for most of the ideas embodied in the project. The forms of the tunnel linings and the methods of driving have been changed several times, and one very serious accident has happened. It has been lying idle now for about four years. About 4,100 feet of one of the two parallel tunnels have been built, and a small portion of the other. About 1,400 feet of the first tunnel remain to be completed. This tunnel has cost $4,000,000, and will cost about $1,000,000 more. A new lot of English capital has been interested in it and will probably push it to completion.

CURRENT INFORMATION.

NEXT MEETING OF AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.

The fourth annual meeting of the American Society of Municipal Improvements will be held in Nashville, Oct. 5, 6, 7 and 8. The program has not yet been arranged, but Secretary Fulton writes that he hopes to have it ready in time for publication in the next issue of Municipal Engineering, and the assurance is given that a number of important papers will be presented. The sessions of the society will be held in the hall of the Tennessee House of Representatives. Secretary Fulton writes:

"The sessions will be arranged so that delegates may have an opportunity to visit the centennial and still transact business. Many important points of interst are in the vicinity

AUG. HERRMANN,
President American Society of Municipal Improvements.

of Nashville, both to the old pioneer and those who came later, but who are conversant with history. The city engineers and directors of public works of all our cities should make a special effort to attend this convention and after attending one convention they will need no second invitation as long as they remain city officials."

The American Society of Municipal Improvements, now in the fourth year of its existence, is composed of officials of the leading cities, including, mayors, aldermen, councilmen, boards of works, city engineers, street commissioners, sanitary officers, etc., numbering between two and three hundred. The sessions which have been held in previous years have been well attended and have resulted in a profitable interchange of views on important municipal questions. The scope of the work is indicated by the standing and special committees on the following subjects: Street paving, sewerage and sanitation, water works and water supply, electric street lighting, taxation and assessments, city government and legislation, disposition of garbage and street cleaning, coating of cast iron and melted steel pipes, electrolysis,

E. B. GUTHRIE,
First Vice-President A. S. M. I.

abolishing of railroad crossings in cities. The papers and discussions at the last meeting in Chicago covered a wide range of practical questions. In referring to the benefits derived from the organization by officials Secretary Fulton says: "Besides the discussion of the papers, there is that intercourse of the officials of the different cities in a business and social way that always tends to increase an offi-

D. L. FULTON,
Secretary A. S. M. I.

cial's efficiency. There is always one point about these conventions, and that is that when a city once sends a representative to them they need no invitation for the next year, for their officials always gain enough

information to pay them to send more delegates the next year."

The present officers of the organization are as follows:

President—August Herrmann, president of the board of administration, Cincinnati.

First Vice-President—E. B. Guthrie, city engineer, Buffalo, N. Y.

Second Vice-President—W. D. Kerr, health commissioner, Chicago.

Third Vice-President—Ernest Adam, city engineer, Newark, N. J.

J. L. KENNEDY,
Treasurer A. S. M. I.

Treasurer—John L. Kennedy, board of public works, Nashville, Tenn.

Secretary—D. L. Fulton, street commissioner, Allegheny, Pa.

Special railroad rates will be secured for the meeting. An attraction in connection with the meeting will be the Tennessee Centennial Exposition, and arrangements will be made allowing opportunity for seeing it, as well as for excursions to places of interest in the vicinity of Nashville.

CONVENTION OF MAYORS AND COUNCILMEN.

A call has appeared for a national convention of mayors and councilmen to meet in Columbus, O., Sept. 28, 29, 30, and Oct. 1. The objects set forth in the call are as follows:

1. The formation of a national organization of the chief executives and members of councils of cities in the United States.
2. The hearing of addresses on important municipal topics by distinguished speakers.
3. The general discussion of all questions pertaining to the administration of all branches of municipal work by mayors and councilmen from all parts of the country.
4. The interchange of ideas and knowledge on municipal problems, such as will result from the experienced city officials coming in contact with each other.

You will readily observe that the objects of the convention were designed with a view to securing a general discussion of all questions pertaining to municipal administration by those who have had the actual experience in the work—the officials themselves. Such a discussion, bringing out as it will an interchange of original ideas and knowledge among men experienced in city government, cannot fail to result beneficially to the taxpayers of the cities which will be represented by their officials in this convention.

The convention will deal with such important topics as the granting of street railway, gas, electric and other franchises, and the control of and revenue derived from corporations enjoying such privileges; the collection and disposal of garbage, which is a branch of municipal work still in the experimental stage; the relative merits of the various street paving materials, including cedar block, brick, granite, Medina block, asphalt block and the different kinds of sheet ashpalt; the cleaning of streets, which is still a vexatious problem in many cities; the municipal management of lighting plants and the cost of street lighting under the contract system; the municipal management of public water supplies and the necessity for water filtration; fire and police protection; parks and playgrounds; municipal finances; taxation and special assessments; the regulation of the social and saloon evils, etc. It is not intended to make this a municipal "reform" convention, but a meeting of experienced city officials for the dissemination of facts, rather than theories.

The local committee of arrangements for the meeting is composed of Samuel L. Black, mayor of Columbus, chairman; Gilbert H. Stewart, J. Y. Bassell, H. T. Benham, Cotton H. Allen, J. H. Canfield and W. D. Park.

The objects of the proposed organization are so nearly identical with those of the American Society of Municipal Improvements and the meeting is so near the time of the latter's annual convention that it seems the promoters of the Columbus meeting must be proceeding without adequate knowledge of the character of the American society, or, for some unknown reason, wish to accomplish the same purpose through a new organization. As most of the officials whose names are connected with the new movement are men who have been recently elected it seems probable that they are not fully aware of the objects and scope of the existing organization, and that the Columbus meeting has been called without the knowledge that a meeting of similar character will be held a week later at Nashville, which will be attended by representatives of many American cities. The formation and continuation of two organizations, similar in character and purposes, will probably result unfortunately for one of the organizations, if not both.

Mr. Herrmann, president of the American Society of Municipal Improvements, replying to a question as to whether the proposed organization represented purposes different from the one of which he is now the official head, writes to the editor of Municipal Engineering:

Columbus the last week of September of mayors and councilmen for the purpose of forming a national organization, representing interests connected with municipal government. It seems to me, from what I have heard of the proposed new organization, that it represents practically the same objects as the American Society of Municipal Improvements, and therefore see no necessity for forming a new organization.

"As you will see from our last report, showing the membership of our society, it includes a number of mayors and also a great number of councilmen, and we are making a special effort this year to get a number of new ones. Our membership is over two hundred, representing over seventy cities, and it seems to me it would be better for the people interested in forming the new organization to come into the older one, especially as we have been established for quite a while and will have a number of interesting papers and reports of committees this year.

"I expect that at our next meeting, to be held at Nashville on Oct. 9, we will have not less than 250 members, representing over seventy-five cities. Very truly yours,

"AUG. HERRMANN.

"Cincinnati, O., Aug. 23."

Since the Columbus meeting has been called it is to be hoped that it will be the greatest possible success, but before proceeding to form a permanent organization as a rival of one already in existence, it would be well to carefully consider the question as to whether all officials representing the interests connected with municipal government cannot be brought together in one organization to better advantage than if their efforts are divided between two associations. Napoleon's declaration that one bad general is better than two good ones may be applicable in this instance.

PROTECTION OF ASPHALT STREETS.

The street and water commissioners of Jersey City, N. J., submitted new ordinances recently for the protection of asphalt streets. All heavy wagons are excluded from them unless their tires be, if the wagon weighs 2,000 pounds, 3 inches wide, and if 3,000 pounds, 4 inches wide. The rules provide that when the weight exceeds 4,000 pounds the tires shall be at least 5 inches wide; 5,000 wide; 7,000 pounds, 8 inches wide; 8,000 pounds, 6 inches wide; 6,000 pounds, 7 inches pounds, 9 inches wide; 9,000 pounds, 10 inches wide; 10,000 pounds, 11 inches wide. The penalty for violation is to be not less than $5 nor more than $25 for each and every offense. The ordinance excepts wagons or other vehicles used in conducting a business located on asphalted streets, or wagons or other vehicles used for the delivery of supplies or removing goods or merchandise along asphalted streets, under restrictions. Pedestrians are given the right-of-way at all street crossings, and all wagons must keep as near the curb line as possible, and not exceed a speed of seven miles per hour. The ordinances were passed Aug. 9.

LIABILITY ON PROPERTY CONDEMNED FOR PARK PURPOSES.

A decision, which is considered of much importance, was rendered by Judge Gates of Kansas City, Mo., July 24, to the effect that "if a piece of property is condemned for park purposes and then later the street upon which the property fronts is paved and tax bills issued, the original owner of the land is not compelled to take up the tax bills." The suit was instituted by E. L. and W. C. Scarritt, whose property on East Fifteenth-st. was condemned for the Paseo. Shortly afterward Fifteenth-st. was ordered paved and curbed, and tax bills, amounting to $600, were issued, but the owners refused to pay, averring that they were not liable as the property had already been condemned. A friendly suit was begun, the property-owners depositing the $600 with the court to show good faith on their part, the result of which was that the money was ordered returned to the depositors and that they could not be made to pay. The case will be taken to the court of appeals. Judge Gates did not touch upon the point as to who was really liable for the tax bills.

PROFITING FROM THE SALE OF WATER WORKS.

An opinion by Chief Justice Doster of the Kansas Supreme Court in the Topeka, Kas., water works case, severely criticises the manner of the sale of the works. Joab Mulrane was for a number of years president of the Topeka Water Works company, which had a capital stock of $400,000. Through agents, Coffin & Stanton of New York purchased the property for $550,000, or $150,000 more than the face value of all its stock. The sum that the property brought was known to but very few for some time, but it finally leaked out, and the stockholders began giving Mr. Mulrane trouble over it. Michael O'Brien, who had been secretary of the company and owner of stock, having a par value of $7,500, took the matter to court for settlement. Here testimony was offered which tended to prove that President Mulrane had received an offer from the New York brokers, but had kept it secret from the other stockholders, and when he found that the brokers intended purchasing the property he advised the stockholders to sell their property, that he

would look for a purchaser and if he found one, would sell at par, and that if he could do a little better he would keep the advance above par for his services. He then closed the contract for $150,000 more than the property's face value and retained the money. Mr. O'Brien sued him for $2,367, the difference between the par value of his stock and the price for which it was sold, and won his case in the district court. Mr. O'Brien died and the case was carried to the Supreme Court, which affirmed judgment in favor of his estate. The court holds that "where the stockholders being ignorant of the selling value of their stock authorize the president of the company to find a purchaser and effect a sale of their shares of stock at par, and such president at and before such time was in secret correspondence and negotiation for the sale of the stock with a view to a large profit to himself, and by affirmative acts and misrepresentations conceals his transactions from the stockholders, and effected a sale of their stock for a sum largely in excess of par, he cannot retain such excess, but must account to the stockholders for the profits made notwithstanding he had stated to them that he would retain for his services as agent any sum realized above that for which he was authorized to sell."

A TOWN RELIEVED FROM PAYING WATER RATES.

A decision was rendered by the supreme court Aug. 6 in the case of the Raton Water Works company vs. Town of Raton, Mexico. The town council entered into an agreement with the company, in 1891, to furnish water at a certain rate per hydrant, but, at the rate stipulated, the total amount due the water company each six months reached $1,962.50, which would have soon absorbed the whole income of the town in the payment of water rentals. The law, as interpreted by the town council, proved this far in excess of the amount allowed by law for use for that purpose, which, the council contended, was the product of two mills tax on each dollar of taxable property. The water works company claimed the full amount of its semi-annual rental, alleging that if the same were more than the amount allowed by law for that particular purpose the city might still use its revenue from other sources for the purpose of paying water rents. The water company ran in a suit filed before Judge Smith at Las Vegas, praying that the town of Raton be required to pay the full amount. The case was taken to the supreme court, where a decision was rendered fully sustaining the contention of the town.

TAXING CITY WATER MAINS IN NEW YORK.

Chief Engineer Kuichling and Corporation Counsel Rodenbeck of Rochester, N. Y., visited the tax officers of ten towns recently on the line of the Rochester water works conduit to ascertain how much had been levied on the city for the water works property it owns in those towns. Previous to last winter the state law expressly excepted the property of municipal corporations used for public purpose from taxation, but in 1896 the law was amended by the addition of substantially the words "excepting that portion outside the boundaries of the municipality." The construction the tax officials of the towns place upon the amendment is that there was an intention on the part of the legislature to tax property outside the boundaries of a municipality and belonging to a city. Of ten towns in which the city owns property that property in nine of them has been assessed. The grand total of eight of the towns is $692,790. The amount in Brighton could not be ascertained. The city will fight the claims of the town assessors.

IRREGULARITIES IN CHICAGO WATER WORKS DEPARTMENT.

Evidence of fraud in the collection and rebating of bills in the water office has been discovered by Alexander Harper, Chicago's expert accountant, which will result in a loss of several thousand dollars to that city. Trusted employes are supposed to have worked in collusion with outsiders, and through a cleverly devised plan have been rebating water bills and giving forged receipts for the money received. The practice of making undercharges has continued since September, 1895, but carefully laid plans of Mayor Harrison to trip them on minor offenses have succeeded in discovering those involved in the charges of fraud.

COMPROMISE OF THE WATER WORKS LITIGATION AT DES MOINES.

An agreement has been reached by the water committee of the city council, Des Moines, Ia., and the water company, by the terms of which the city and the company each withdraw all pending litigation relating to contentions about rates or bills due the company in consideration of the payment by the city to the company of the sum of $15,000 in full for the claim of $31,000, as balance unpaid for water claims of the company against the municipality. A condition of the agreement is that consumers shall have the right to demand meters and pay for the water used as shown by the meter register. The meter shall be subject to the supervision

of the board of public works, which is clothed with authority to inspect and condemn them as conditions may warrant.

PLANS FOR PROTECTING THE HONESTY OF METERS.

L. E. McGann, commissioner of public works, Chicago, Ill., has determined on a method of reading meters which will destroy the possibility of rate-takers being in collusion with property-owners and thus bilking the city. The method will consist of the electrical plan or the ink impression plan. The electrical plan would involve the wiring of the 4,000 meters in the city and connecting the wires with registering dials in the city hall directly under the eye of the water office superintendent. The ink impression plan, which consists of applying an ink pad to the dial of a register, so that the impression cannot be erased, but must be returned to the city hall by the rate-taker just as he took it, would not interfere with the changing of a meter by means of nippers.

LITIGATION OVER THE INTERRUPTION OF TRAFFIC BY PUBLIC WORK.

The supreme court of Pennsylvania has rendered a decision in the suit brought by the Ridge Avenue Railway Co. against the city of Philadelphia for $100,000 damages resulting from interruption of traffic while street improvements were being made. The litigation began twenty-two years ago, and all the original counsel in the case are now dead. The railway company claimed that it had suffered great loss during a period of four years in which Ridge avenue was being improved. The decision of the court sustains the contentions of the city for the most part, and concludes that much obstruction of public travel by private vehicles and cars had occurred as the result of the work done under the various contracts; that the evidence failed to show any negligence of the city clearly causing damage to the company; that the city deemed a long-continued prosecution of the work by many contractors in succession as less injurious to the public interests than a performance of the entire work at one time, which would have completely stopped travel for a short while; that the railway company had no greater right against interruption in course of highway improvements than any other person, private or corporate, using the road; that the city had the right to adopt such a method of allotting and carrying out the work as to it seemed best; for the damage resulting to the public, because of the necessary interruption to travel during the progress of the work under the plans adopted, it is not answerable to one of the public unless the complainant shows a damage different in kind and peculiar to himself; that the damage here shown by the plaintiff, though probably different in degree from that sustained by others, was in the same kind as suffered by the general public using the street.

FINAL JUDGMENT IN THE COLUMBUS SEWER CASE.

The motion of the city of Columbus, O., to have the award in the West Side sewer case set aside, principally on exceptions taken to the ruling of the arbitrators, was refused July 26, by Judge Evans, who entered up judgment against the city for $13,985.61, which was the amount due. In his decision Judge Evans pointed out a number of irregularities on the part of the city, and declared that there was nothing before the court to decide.

UNIFORM METHODS OF TESTING.

The International Society for the Testing of Technical Materials held a meeting at Stockholm, Sweden, August 23, 24 and 25, the object of which was to establish uniform methods for testing building and other materials. The society has nine English, sixty American, 369 German and 191 Russian members, while the supply from other countries makes a total membership of more than eleven hundred. The proposed establishment of standard systems of testing is of much importance, as considerable confusion has existed in the past.

CIVIL SERVICE IN CHICAGO.

Commissioner of Public Works L. E. McGann, Chicago, Ill., called together, Aug. 16, all heads of departments under public works and instructed them that the men on the lists certified by the civil service commissioners must be appointed to places made vacant by the expiration of the sixty-day terms. This will result in the dismissal of 1,000 sixty-day employes whose places will be filled by eligibles from the civil service lists, which includes 3,500 names.

DEDUCTION FOR FAILURE TO COMPLY WITH SPECIFICATIONS.

A decision rendered by Judge Sloan in the case of A. H. Hamilton vs. the city of Ottumwa, Ia., holds that the brick paving laid in front of the property owned by the plaintiff was not up to the specifications of the contract and orders a deduction of $1,016 from the amount taxed, and the city to bear the costs of the trial.

REDUCING THE NOISE ON A RAILROAD VIADUCT.

The Park Avenue Improvement Board, New York City, is making a series of experiments on a portion of the viaduct in the New York Central & Hudson River railroad, from One-hundred-and-tenth street to the Harlem river, to determine the practicability of reducing the noise made by the trains as they pass over the viaduct. The roadbed of the viaduct is a continuous steel structure and produces a great volume of sound, in the way of roaring and rumbling when a train passes over it. The test will be made with wood chips mixed with cement and asphaltum, in proportions, in accordance with the committee's ideas. The mixture weighs 24 pounds to the cubic foot. The troughs are first thickly coated with asphaltum paint and then filled with the sound-deadening compound to within two inches of the top; a thin coating of asphaltum is placed on top of this, making the mixture absolutely water tight. The filling in of the troughs will stop all vibrations and reduce the noise so that it will not be greater than that produced by a train running on the ground with the usual track ballast.

A MUNICIPAL PURCHASING AGENT.

Mayor Harrison of Chicago favors creating the office of a city purchasing agent, whose duty it shall be to purchase supplies for all departments of the city government. This plan has proved advantageous in Cincinnati and other cities. In a paper read before the American Society of Municipal Improvements at Buffalo, Mr. August Herrmann, president of the Cincinnati Board of Administration, stated that the experiment had resulted in a saving of about 20 per cent. in Cincinnati. Mayor Harrison proposes to make the office one of the most important in the municipal government of Chicago, and favors a salary of $6,000 a year. It is expected that this will command the services of a highly competent man, such as the first-class buyers of large wholesale houses. There will also be a deputy purchasing agent.

RIGHT OF BOARD OF PUBLIC WORKS TO EXERCISE DISCRETION.

A decision was rendered August 11 in the paving injunction suits brought against the city of Niagara Falls, N. Y., to restrain the Common Council and Board of Public Works from allowing the Barber Asphalt Paving Co. to pave Buffalo and Erie avenues and Third street.

The referee, Loran L. Lewis, of Buffalo, held that the Council and Board of Public Works have a legal right to exercise their discretion in awarding contracts, and did not think the evidence proved the charge that the officials were actuated by corrupt motives in giving the contract to the Barber company when their bid was higher than others, though he did not agree with the board in its judgment as to the comparative quality of Trinidad or Bermudez and Alcatraz asphalts. On the question of the right of the board to exercise discretion in the award of the contract the referee said: "The charter of the city does not provide that contracts for work shall be let to the lowest bidder. The officials of our municipal governments are necessarily clothed with large discretionary powers in the discharge of their governmental duties. If their proceedings are conformable to law they are not subject to review, provided they are free from fraud and corruption. If courts were empowered to review discretionary acts on the part of legislative bodies, there would be no end to litigation, and the affairs of our municipal government would be thrown into inextricable confusion. So long as city officials exercise their powers and duties honestly and lawfully, they are not subject to the control of the courts. If they are unfaithful to their trusts, the remedy is with their constituents." Lawyers in the case say an appeal will be taken.

JUDGMENTS AGAINST A PAVING BRICK COMPANY.

A decision was rendered by Judge Bundy, as special judge, Aug. 17, in the suit of the Royal Brick Co. vs. the city of Richmond, Ind., and others. When Main street was improved five years ago by the Standard Paving Co. of Detroit, Mich., the city retained 10 per cent. of the contract price for five years to insure repairs, which amounted to $65,000. While the work was in progress the Standard Paving Co. became involved and assigned orders to its creditors on the reserve fund held by the city. The creditors are the following: First national bank, Richmond, $2,435.95; Second national bank, $64.69; Oolite Quarry Co., Bedford, Ind., $1,707.84; Peninsular savings bank, Detroit, Mich., $7,500; Royal Brick Co., Canton, O., $15,115.34; Irvin Reed & Son, Richmond, $79.55; Mather Bros., Richmond, $202.45. As the question involved was the priority of claims, Judge Bundy ruled that the reserve fund be immediately distributed as far as available among the creditors in the order named: First national bank, Second national bank, Oolite Quarry Co., Irvin Reed & Son, Mather Bros. and Royal Brick Co.

DEFECTIVE SEWER WORK IN CHICAGO.

Officials of the public works department Chicago, Ill., announced, Aug. 19, that during the last three years about $200,000 had been lost to the city through the deals of dishonest contractors with city officials in the sewer department; that evidence had been secured that, thus far, shows that contractors were allowed to construct miles of large sewers with material unfit for use, and that, in many instances, the plans and specifications were apparently ignored.

NEW REQUIREMENTS IN BIDS ON SEWERS.

The Street and Water Board, Jersey City, N. J., unanimously resolved, Aug. 16, to direct the chief engineer to file with the clerk of the board a schedule of the various items which enter into the construction of public sewers, and into the making of public improvements, together with a fair maximum and minimum price on each item, and that the chief engineer shall insert in all specifications for street or sewer work a clause stating that in proposals subsequently submitted a bid will be considered unbalanced and rejected if any item is quoted at a price greater than the maximum or less than the minimum denoted in the schedule. This action upon the part of the board has been brought about by charges of "contractors' rings" and "unbalanced bids," on the part of the Jersey City newspapers.

SETTLEMENT OF LONG PENDING LITIGATION.

The long drawn out litigation between the Barber Asphalt Paving Co. of New York and the Long Branch Commissioners is ended, a settlement having been effected.

Five years ago the Long Branch Commissioners contracted with the company for asphalting certain streets at a cost of about $160,000, the greatest portion of which the property-owners along the line were required to pay. Many refused and carried the matter into the courts. Unable to collect the assessments, the commissioners, after paying in cash all but about $30,000, issued notes for the balance.

Before these notes became due the Supreme Court decided that the law under which the asphalt was put down was unconstitutional. Under this decision the Board of Commissioners, upon the advice of counsel, refused to honor the notes.

The Barber Co. sued the town for $30,000 and recovered judgment when the commissioners carried the case to the Court of Errors and Appeals.

The Barber Co. and the commissioners have now agreed to abandon all litigation. The commissioners paid the company $10,000, with accrued interest, and further agreed to pay $5,000 at the expiration of sixty days and the balance of the $30,000 in eighteen months. This settlement seems to please the tax-payers, and it is possible that the property-owners who have contested the collection will settle in full.

LIABILITY FOR TAKING THE WATER SUPPLY OF SPRINGS.

The Second Appellate Division has reversed judgment in the suit of Walter R. Smith against the City of Brooklyn, N. Y. The city erected upon land purchased by it at Freeport, L. I., water works consisting in part of wells and a conduit about twenty-seven feet below the surface of the ground, connected with powerful suction pumps, the effect of which is to lower the spring level of the surrounding country and to dry up a stream on the farm of W. R. Smith, nearly half a mile distant, which was fed by springs and had run in a well-defined channel for fifty years, and forming, when dammed, a pond valuable to the owner of the land. The suit for damages was dismissed, but Justice Hatch of the Second Appellate Division holds that this was an unjustifiable use by the city of land acquired by it and renders it liable in damages to the owner of the pond.

STREET CLEANING IN DIFFERENT CITIES.

Recently the Syracuse Courier sent letters to officials in several cities making inquiries regarding the cleaning of streets. In reply Paul Muenzberg, commissioner of public works in Milwaukee, says that the flushing of asphalt pavements has been found most economical and the most satisfactory there. Other kinds of pavements are swept after 8:30 p. m. In New York City a small hand steel scraper about three feet wide is used on asphalt streets. Flushing is being tried. Day work with the block patrol system has been found the most thorough. In Baltimore flushing of asphalt streets has proved most effective and sweeping is also used. In Brooklyn the asphalt pavements are swept with hand brooms. In Albany, N. Y., machines and hand brooms are used. Flushing has been tried and is not satisfactory. In Binghamton the streets are flushed twice each week and in the day time they are cleaned with scrapers. Sweeping machines are used at night in Kansas City and streets are cleaned in day time with hand brooms and shovels. The average cost of cleaning asphalt by this method is $3.81 per mile. Three miles

of asphalt are flushed every night at an average cost of $4 per mile. In St. Paul hand scrapers and sweepers are used, the dirt being afterward collected in barrels. In general one of the main objections to flushing is the muddy and slippery condition it causes on asphalt, and wheelmen are especially hostile to it for this reason.

EMBEZZLED TEN THOUSAND DOLLARS.

Clifford H. England, cashier in the Detroit office of the Warren-Scharf Asphalt Paving Co., early in August embezzled $10,000, and, with his wife, disappeared. Detectives have failed thus far to capture him. He entered the employ of the company five years ago as an office boy, but rapidly advanced to the position of trust and responsibility which he held at the time of his crime. He is only twenty-two years old. The embezzled money was drawn from bank a few hours before his disappearance.

FALL RIVER PLAN OF SEWER ASSESSMENTS.

The special committee on sewer assessments appointed by the city council of Fall River, Mass., has submitted its report, which is discussed elsewhere in this number of Municipal Engineering. The ordinance prepared for enactment by the council, so as to carry into effect the plan proposed by the committee, is as follows:

Section 1. Two-ninth parts of the whole cost of the sewerage system, estimated at $3,150,000, including the cost of laying, making and maintaining its common sewers, shall be paid by equitable annual charges or rents for the use of such sewers, by the persons who have entered and who enter the same, and one-ninth part of such whole cost shall be paid from assessments upon estates receiving benefit according to the frontage of such estates on any street or way where a sewer has been constructed, and on the area of such estate within a fixed depth as hereinafter prescribed, and the remainder shall be paid by the city and raised by general taxation; all of said assessments, charges and rents to be made, certified and collected as hereinafter prescribed.

Section 2. An assessment shall be made upon the owners of abutting estates, by a fixed uniform rate based upon the estimated cost of the entire system, of 15 cents a linear foot of frontage of such estate on any street or way where a sewer is constructed, and of three mills a square foot, according to the area of such estate within a fixed depth of 125 feet from such street or way; but no area shall be assessed more than once.

No assessment in respect to any such estate which, by reason of its grade or level, or for any other cause, cannot be drained into such sewer, shall be made certified, or notified until such incapacity is removed.

When such estates abut upon more than one such street or way, such assessment shall be made upon the whole of the longest frontage and fifty feet of the frontage upon each other such street or way shall be exempted from such assessment, but all in excess of said fifty feet exempted shall be subject to assessment.

In making such assessment the frontage shall be assessed to the nearest foot and the areas shall be determined from the plans on file at the city engineer's office.

The board of aldermen shall direct the city engineer to prepare and submit plans to said board, showing the estates to be assessed, giving the owners' names, frontage and areas, together with a schedule showing the assessments on the estates abutting and benefited. The amounts assessed and certified by the mayor and aldermen shall be entered upon the plans prepared for assessment, and shall, for the two years after they are laid, constitute a lien on the real estate assessed, and shall, together with all incidental costs and expenses, be levied by sale of such real estate, if the assessment is not paid within three months after a written demand for payment, made upon the person assessed, or upon the person occupying the estate; such sale to be conducted in like manner as sales for the payment of taxes.

Owners of estates or parts of estates not liable to assessment as aforesaid, shall pay for special benefits to such estates such reasonable sums as the mayor and aldermen shall determine.

The collector of taxes, upon receipt of the schedule of assessment certified by the mayor, shall forthwith render notice of assessment and amounts of the same to the parties assessed therein, and said amounts shall be due and payable thirty days from the date of such notice, after which time interest shall be charged thereon at the rate of 6 per cent. per annum.

Sec. 3. Every person or owner of an estate who has entered or who enters his particular sewer into a common sewer shall pay for the use of such sewer an annual rental determined upon the basis of water service, as follows.

For unmetered water service, except as hereinafter provided, where the amount annually paid to the city for water service exceeds $20, $8, and in addition thereto a sum equal to two-fifths of the amount paid for the water service over said $20; for all unmetered water service, $8, excepting as hereinafter provided; for metered water service, 10 cents per 1,000 gallons of sewerage delivered to the sewer, the quantity so delivered to be determined by the meter readings taken by the water department, but the annual charge shall in no case be less than $8, it being provided that any such person or owner may place at his own expense a water meter which shall be approved by the city engineer to measure the amount of water which does not enter the sewer. Every such person or owner who drains into such sewer water taken from any source other than the city water service shall pay such just and equitable annual charge or rental for the use of said sewer as the city council shall by vote from time to time determine; provided, however, that any such person or owner may place, at his own expense, a water meter which shall be approved by the city engineer to measure the amount of water which enters the sewer. The charges of rentals so determined shall be certified by the mayor on behalf of the city council and a schedule

thereof transmitted to the collector of taxes.

The collector of taxes, upon receipt of said schedule, shall forthwith render notice of the assessment and amount of said charge or rental to the parties assessed therein.

Such charges shall be collected quarterly, and shall constitute a lien upon real estate using the water, to be collected in the same manner as taxes upon real estate, or in action of contract in the name of the city of Fall River.

USE OF ALUM IN WATER FILTRATION.

To the Publishers of Municipal Engineering:

Please send me twenty copies of your August number of Municipal Engineering. I have read with great interest the article "Experiments in Water Filtration," and want these extra copies to send to our doctors that they may get posted regarding the use of alum as used in connection with mechanical filters. Prof. Wixford's tests are convincing proof that the alum is not only harmless, but is of great advantage in purifying water. We have a plant of 22-10 inch mechanical filters, pressure type, which is very successful. We use alum in small quantities, and analysis has proven that the alum is decomposed and is eliminated with other impurities with the wash water, but there remains a prejudice in the minds of some that they dare not drink our water because we "put alum in it."

F. C. AMSBARY, Supt.

Little Rock, Ark., Aug. 16.

NEW PUBLICATIONS.

Experiments Upon the Contraction of the Liquid Vein Issuing From an Orifice and Upon the Distribution of the Velocities Within It. By H. Bazin. Translated by John C. Trautwine, jr., C. E. $2.00. John Wiley & Sons, New York.

Mr. Trautwine is doing a considerable service to American engineers by his translations of the best memoirs upon hydraulic experiments by experienced foreign observers. The present volume contains the results of measurements of the form of the liquid vein issuing from an orifice in a reservoir and of the velocity of the water in various portions of the cross-sections. The measurements are taken at the orifice and at various definite distances from it, those of form by means of a frame with points projecting toward the center and movable by means of screws, and those of velocity by means of special forms of Pitot tubes. The orifices used were a square twenty centimeters square, a circle of twenty centimeters diameter and a rectangular orifice eighty centimeters wide and twenty centimeters high in the vertical side of the reservior; and circular orifices twenty and ten centimeters in diameter in the horizontal bottom of the reservoir. Determinations of the co-efficients of discharge for such orifices are obtained with the utmost accuracy under several conditions of difference of head and velocity of approaching stream. The results of the work are very valuable as careful determinations of quantities and circumstances of discharge, and the text and tables are very valuable, as they will give the student a clear idea of the form of the vein at various points and the action of the water therein, and thus enable him to better understand the results of his own experimentation. The many carefully conducted series of experiments upon the action of water which have been made in the last few years are adding much definiteness to our knowledge of the subject and reducing practical hydraulics more nearly to an exact science.

Elements of Mechanics, Including Kinematics, Kinetics and Statics, with Applications. By Thomas Wallace Wright, M. A., Ph. D. $2.50. D. Van Nostrand & Company, New York.

Professor Wright has prepared this book for the use of his college classes, and the present volume is a revised and enlarged edition of his former "Text-Book of Mechanics." It is possible to use the book with little or no knowledge of the calculus, although the use of that branch of mathematics will materially aid in the ease of reading and understanding it. Although primarily intended for class-room work it is well adapted for private study and contains a great variety of theoretical and practical problems to exemplify the application of the principles developed. A feature of the book which is worthy of special notice is the clearness of the statement of the difference between the absolute and the gravitational units of force and the fidelity with which the difference is maintained throughout the work. The book being intended primarily for engineers, the common gravitational units are employed in general, but wherever necessary for a proper presentation of the subject the units are carefully explained, a good statement is made of their terms and hints are given of their field of usefulness in theoretical discussions in astronomy, physics, electricity and mechanics. A full review of the book is not possible in the space at command, and it must suffice to say that the problems of the branches of mechanics given in the title are clearly stated and demonstrated in a logical order, which leads the student forward by easy steps, which are fully exemplified by the varied examples, and fastened in mind by series of examination questions which follow each division of the subject. Engineers desiring to connect

their ideas of mechanics with the latest advances in that subject and those wishing to acquaint themselves with its principles will do well to secure the book. The older engineers will miss some familiar terms, such as vis viva, virtual velocities, force of inertia, but they are omitted with advantage, as clearness of thinking and accuracy of statement are more nearly attained.

Sewer Flushing Diagrams. From actual tests made principally on pipe sewers, showing how far the discharge from a flush tank will give a self-cleansing velocity. By S. H. Adams, C. E., London, Eng. $5. New York. Spon & Chamberlain.

Three large pages on card board contain the diagrams, which are evidently drawn from actual observations in sewers. Twelve of the diagrams are for 9-inch sewers, with gradients varying from one foot in 47 to 1 in 342, lengths of 1,200 to 2,500 feet and quantities of discharge of 268 to 1,000 gallons at one flush. Nearly all the sewers have several different gradients in their course, combinations of steeper preceding, following, both preceding and following, and occurring between flatter gradients. Five examples of 12-inch pipes are given with variations of gradient from 1 in 32 to 1 in 1,000, in length from 1,400 to 3,500 feet, and in amount discharged in one flush from 434 to 8,287 gallons. A smaller number of diagrams for 15, 18 and 21-inch pipe sewers and brick sewers 2x3 and 3x2.6 are given, some of these having two or more sizes in the length of sewer given.

The diagrams give the length of sewer on which observations were taken, the velocities in feet per second, the depth of the ordinary flow of sewage observed, and the depth of water due to the flushing stream. In nearly every instance the observations are taken on a sufficient length of sewer to show a reduction in velocity to two feet a second and in some cases to a greater distance. The effect of the flushing stream is apparently valuable to distances varying from 1,300 to 2,500 feet, with discharges of flushing water less than 500 gallons and the distances increase to 3,500 feet for 12 to 18-inch sewers and 2,288 to 8,287 gallons discharge. The diagrams can be used to estimate the distance to which the flushing effect may be expected to extend.

The writer of these comments has had an opportunity to examine the diagrams showing the results of similar experiments in the sewers of Omaha, Neb., with 130 to 400 gallons flushing discharge, which show similar results to those shown on these diagrams, the effects of the flush not being felt quite so far as is shown on the diagrams, being effective in 8-inch pipes for 800 to 1,500 feet, the pipes increasing in some cases to fifteen inches in diameter. A valuable bit of information not given on the diagrams is the rate of discharge of the tank, which in some instances is quite essential to an intelligent comparison of results.

The diagrams are of value as being the only detailed published data on the subject, and for use in exhibiting the value of flush tanks and in determining their number and location in a system of sewers.

Tables showing loss of head due to friction of water in pipes, by Edmund B. Weston, C. E., 171 pp. N. Y. D. Van Nostrand & Co.

The experience of Mr. Weston convinced him that the same formula for the flow of water would not apply to all sizes of pipes. He therefore proceeded to develop a formula for small pipes which assumed the form (1)

$$h=\left(0.0126\,\frac{0.0315-0.06\,d}{\sqrt{v}}\right)\frac{l\,v}{d\,2g}$$

h equal (0.0126 plus 0.0315-0.06 d-v) l v2 d 2g, in which h is the loss of head due to friction, in feet, d is the internal diameter of the pipe in feet, v is the velocity of flow in feet per second, l is the length of pipe in feet and 2g is 64.324. This formula is applied to smooth pipes similar to lead and brass pipes having inside diameters of ½ to 3½ inches. The first seventy-two pages of this book gives tables for pipes of sizes ½, ⅝, ¾, 1, 1¼, 1½, 2, 2½ and 3 inches, which tables give in the respective columns the velocity in feet per second the head required to produce this velocity, the discharge in gallons a minute and in gallons in twenty-four hours at this velocity, the loss of head due to friction per 100 feet of pipe, and the loss of head due to the orifice of influx. The discharges assumed increase in the table by equal increments of one-fourth gallon per minute for one-half inch pipe to eight gallons per minute for three-inch pipe from a velocity of zero to one of fifty feet a second and all results are carried to two places of decimals. Greater detail could not be desired.

The remainder of the book is given to tables of flow of water in pipes varying in size from four inches to sixty inches, based on Darcy's formula, the form marked (2) being used for velocities less than 0.33 feet a second and form (3) for greater velocities:

$$(2)\quad h=\left(\frac{0.017379+\frac{0.015965}{d}+\frac{0.0040723+\frac{0.000020816}{d^2}}{v}}\right)\frac{1}{d}\,\frac{v^2}{2g}$$

$$(3)\quad h=\left(\frac{0.0198920+\frac{0.00166573}{d}}{d}\right)\frac{1}{d}\,\frac{v^2}{2g}$$

Tables are given for extending the main tables beyond the limits set for them, and an auxiliary table is given for applying the results in the main tables (for smooth pipes) to pipes of various lengths of service and consequent tuberculation and reduction in the area of cross section.

The tables are very valuable and are in sufficient detail to suit the most fastidious.

In June was noticed The Graphical Solution of Hydraulic Problems by Freeman C. Coffin, the larger part of which is given to graphical solutions of the same problems that can be solved by means of these tables.

Mr. Coffin's diagrams are constructed on the Chezy formulae, which for pipes reduced to the form

$$(4)\quad h = c' \frac{l}{d} \frac{v^2}{2g}$$

in which the value of c' does not depend upon d and v as do the coefficients in parenthesis in equations (1) (2) (3). Mr. Coffin uses value of the coefficient obtained by Hamilton Smith, jr., which really show a dependence of c upon d and v. The results for loss of head per 100 feet will differ somewhat if derived from Weston's tables or from Coffin's diagrams, on account of the differences in values of c. For small pipes up to 3 inches in diameter Coffin's diagrams will give results for loss of head larger than the tables by quantities varying from 0 for low velocities and smallest pipes to 25 per cent. for higher velocities and larger sizes. The tables are much more extensive than the diagrams. For larger pipes 4 inches to 60 inches, the tables will give results for loss of head greater than Coffin's diagrams by quantities varying from 0 for low velocities and small sizes to 75 per cent. for 60-inch pipe and 6 feet a second velocity. Within ordianry limits the two will agree very well. The diagrams are more convenient and save much time in making approximate computations, and the tables will give more accuracy at the expense of time. The use of the diagrams is sufficient for most cases. The use of the two in combination will be found possible in cases where great accuracy is desired, if the differences in formulae noted above are kept in mind, the approximate result being obtained from the diagram and the final figures from the tables.

The formulae on which Weston's tables are based are the more nearly accurate, and the tables will give results with much more accuracy in the decimal places than the diagrams can. The tables for small pipes are the more extensive and the diagrams for large pipes require less arithemetical computation than the tables.

PERSONAL.

Eugene M. Mills has been appointed assistant city engineer at Hudson, N. Y.

Sam F. Crabbe has been appointed city engineer, to succeed J. T. Graves, resigned, at Fargo, N. D.

Leonard Metcalf, D. S., C. E., recently professor of mathematics and engineering in the Massachusetts Agricultural College, Amherst, Mass., has returned to active practice in hydraulic engineering.

George H. Kalteyer, formerly interested with G. W. Bartholomew, Jr., in the Buckeye Portland Cement Co., Bellefontaine, O., died August 4, in Philadelphia, Pa.

Dr. Hibbert Hill, biologist to the Department of Health, Brooklyn, N. Y., has been appointed biologist in charge of the Rockville Centre Laboratory, which was established in October, 1895, for the continuous examinations of the Brooklyn water supply. I. W. Elms has been appointed chemist.

P. I. Pritchard, president of the street and water department of Wilmington, Del., and William A. Pratt, professor of electrical, mechanical and civil engineering in Delaware college, have been appointed engineers for the Yukon Mining, Trading and Transportation Co. of Wilmington, Del. They sailed from Seattle, Wash., Aug. 1, for Juneau, to examine the route and make a report.

Samuel J. Baker, county surveyor, has resigned the position of village engineer of East Cleveland, O.

Jacob Koerber, who was recently appointed superintendent of water works at College Point, N. Y., has resigned that position.

F. W. Van Buskirk has been appointed city engineer at Stratford, Ont.

Jacob Phinizy, a member of the water works commission, Augusta, Ga., has resigned.

A. L. McCulloch has been appointed engineer to supervise the construction of the water and sewerage system of Nelson, B. C.

James Wheeldon has been appointed chief engineer of the water department at Camden, N. J., to succeed William W. Mines.

W. K. Dunbar, superintendent of the water works at Wellsville, N. Y., has been appointed superintendent of the water works at Warren, Pa. Geo. M. Murphy of Pittsburg, Pa., will succeed him.

C. T. Dike, city engineer at Mason City, Ia., has resigned his position.

J. Waldo Smith, Assoc. M. Am. Soc. C. E., Montclair, N. J., has been appointed superintendent of the Passaic Water Co., with office at Paterson, N. J. H. F. Labelle, New York City, succeeds Mr. Smith as first assistant engineer to the East Jersey Water Co. at Montclair.

John D. Martin of Brooklyn, N. Y., has been appointed superintendent of water works at Asbury, N. J.

William S. Maharg has been appointed city chemist at Chicago, Ill., his work to consist largely in making analysis of the city's water supply.

Jeremiah Keeley has resigned his position as water commissioner at Albany, N. Y.

John Kjelberg has been appointed chief street commissioner at St. Paul, Minn.

Onward Bates, M. Am. Soc. C. E., engineer and superintendent of bridges and buildings of the Chicago, Milwaukee & St. Paul, has had conferred upon him the degree of civil engineer by the University of Wisconsin.

Geo. H. Benzenberg, M. Am. Soc. C. E., city engineer of Milwaukee, Wis., and Chas. Hermany, M. Am. Soc. C. E., engineer and superintendent of the Louisville Water Co., Louisville, Ky., have been appointed consulting and advisory engineers to G. Bouscaren, chief engineer to the new water works at Cincinnati, O.

Edward Duke has been appointed superintendent of water works at Terrell, Tex.

George H. Coffin has resigned his position as superintendent of the water department at Asbury Park, N. J.

Lewis Wilkinson has been appointed superintendent of the Holliston Water Co. at Holliston, Mass.

Josiah Felter has been elected chairman and T. Fergus Redmond secretary of the board of water commissioners at Haverstraw, N. Y.

Buel G. Andrews and John Bowe have been appointed members of the board of water commissioners to succeed Albert C. Tennant and J. J. Kieley, respectively, at Albany, N. Y.

C. D. Barstow, superintendent of the City Water Co., Chattanooga, Tenn., died July 31, at Pine Bluff, Ark.

Edward A. Kemmler has been promoted to third assistant city engineer at Columbus, O.

Walter G. Kirkpatrick, Assoc. M. Am. Soc. C. E., has been elected city engineer at Jackson, Miss.

William E. Harkins has been elected street and road commissioner to succeed R. R. Hagaman at New Brunswick, N. J.

James L. Douglas has been elected a member of the board of public works to succeed Henry Eppihiemer, resigned, at Reading, Pa.

A. D. McCullough has been appointed resident engineer to take charge of the water works and sewerage systems at Spokane, Wash.

F. Herbert Snow, city engineer at Brockton, Mass., has been appointed sewerage commissioner to fill the unexpired term of W. L. Douglas, resigned.

F. J. Hubbard has been appointed borough engineer at Plainfield, N. J.

George McElhinny has been appointed superintendent of water works at Evansville, Ind.

John P. Brooks has been appointed professor of civil engineering in the State College of Kentucky at Lexington, Ky.

Henry B. Looker has been appointed the surveyor of the District of Columbia, to succeed William Forsythe, who resigned on account of ill health and age. Chas. P. Calvert, formerly draughtsman and computer, succeeds Mr. Looker as assistant surveyor.

Chas. C. Cressy has been elected chairman of the Board of Water Commissioners, Gloucester, Mass., to succeed Sylvanus Smith, resigned.

MACHINERY AND TRADE.

WELDING STREET RAIL JOINTS IN PHILADELPHIA.

The Union Traction Co. of Philadelphia is engaged in welding the joints of its street railway track. The work has excited much interest in Philadelphia and the apparatus used in doing it is described by Philadelphia newspapers as "an iron foundry on wheels." It is described by the Inquirer as "like the small cupola of any iron foundry, except that it is mounted on a truck hauled by five stalwart horses. The big furnace is drawn up alongside the track, and a pile of pig iron and old scrap is dumped into the retort. Then a wire is run up and connected with the trolley feed wire overhead. The current of electricity thus obtained starts up an electrical fan that serves to furnish the blast, and cause a heat that soon transfers the bars of pig into a caldron of lurid molten metal. While the metal is heating, shells of cast iron, technically known as grips, are being placed around the joints. The shells are painted inside to make them perfect molds. As soon as the metal is heated it is run off into buckets, which are carried suspended on an iron bar by two stalwart colored men. The laborers simply carry the metal from joint to joint and pour it into the 'grips.'

"In five minutes the grips are unclamped, and in five minutes later the metal has cooled, and the joint or joints treated have ceased to be. A solid rail, made so by a lump of iron that looks like the round joint made by a plumber when he solders a pipe, is the result. The contraction of the iron mold in cooling draws the ends of the rails firmly together. When they meet the rails are generally uneven on the surface. Another electric wire is then brought into play, and this time it is coupled to a small emery wheel. This is sent revolving over the uneven surface, where the two rails have met, and in a jiffy all signs of roughness have been removed.

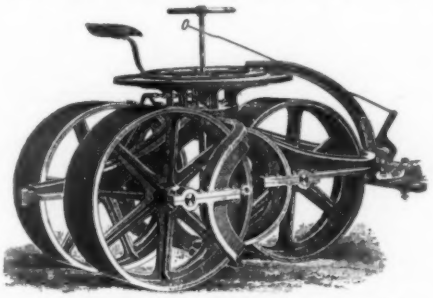
"The making of these joints is a costly process, but experts say they will add five years to the life of the track. This means an enormous saving to the repair account. Incidentally it will give a track that will be much more pleasant to ride over."

ANOTHER MANUFACTURER'S VIEWS ON ROAD ROLLERS.

To the Editor of Municipal Engineering:

We notice in your last issue that a road roller manufacturer, in his own defense, endeavors to show that weight is the only thing necessary in a roller for road

building, and that a horse roller, with its rolls on one rigid bearing line would do as good and effective work as a steam roller with tripedal bearing and of equal or even greater weight, and he appeals to engineers to indorse his claims, when it is well known that engineers almost invariably condemn it and favor the steam roller, notwithstanding the price being three times as great. The Austin roller consists of two rolls on a single inflexible shaft, having a straight line bearing of sixty inches. With a ten-ton roller the average weight of pressure per linear inch is 333 pounds. The material over which this roller passes must support ten tons. If certain portions of this material is



harder than others, the harder portions, which require the least pressure, will support more of the ten tons than the soft parts that need the most pressure, and if the hard portions will sustain the entire weight of the roller, the soft parts get no pressure at all. A level effected in this way is not of uniform density, is a deception and entirely unfit to receive the metallic or other finish.

A trench two feet wide for a small water or gas main, running lengthwise of a road and loosely filled with earth, cannot be packed to the same density by such a roller, for the solid roadway would support the roller on either side of straddle the work and the loose material never get an ounce of pressure.

The perfect roller must fill two requirements. It must not only level the roadway, but bring it to a uniform density as well. Failing in either of these conditions, it is not satisfactory. The steam roller has three rolls tripedal in bearing; two large rolls of narrow width, separated some distance, and on either end of a shaft, while the third roll, on a parallel axial line, is of less diameter but greater bearing width, placed opposite and covering the space left between the two rolls on the one shaft. Each of the bearings of a tripedal form should have equal pressure per linear inch, and as each roller is free to rise or fall independent of the others, any soft spot of sufficient size to receive the width of one of these rolls may be packed, leaving a depression to be filled and again packed by subsequent rolling, and a level of uniform density secured.

The conditions are fully met by the Keystone roller, and we claim advantages in the following points: A roller of small diameter has a tendency to push material ahead of it, while a roller of large diameter will ride over and crush down, and if two large narrow rolls are good to hunt out soft spots, three are better. A ten-ton steam roller has but little variable condition in weight, and in the preparation of road bases while yet soft and irregular is hard to handle, while our roller has in its frame and rolls alone but little over 13,000 pounds weight and can be used in loose material to secure uniform density and levelling. Then weight plates may be added to each roll, 800, 1,600 or 2,400 pounds, or adding to the entire roller 7,200 pounds bring the total weight of the roller over ten tons. A ten-ton roller on a level and uniformly dense roadway would require no more team than a six and one-half-ton roller on soft material. As our roller may be turned around very short and has brakes for use on hillsides, and a tongue without vertical strain in the horses' necks, we have eliminated the faults of the single line roller and acknowledge no rival but the steamer.

KEYSTONE CRUSHER & ROLLER CO.
Pittsburg, Aug. 23.

TRADE NOTES.

E. Wilmot has been appointed receiver for the Globe Stone Co., Cleveland, O. remain the same as before.

The New York & Bermudez Co., New York City, has removed its offices from 25 Beaver street to 11 Broadway.

The Castalia Portland Cement Co., Pittsburg, Pa., has engaged Lathbury & Speckman, of Philadelphia, to design and superintend its new mill, near Castalia, O.

The Hays Construction Co., Charlestown, W. Va., has been incorporated by F. J. Hays, I. R. Hays, O. B. Loose, E. H. Loose, T. J. Clary, Bridgewater, Va.

The Rockland Lake Trap Rock Co., Rockland Lake, N. Y., has been incorporated to quarry trap rock by Wilson B. Foss and Jacob F. Conklin, Haverstraw, N. Y.

The Newark Construction Co., Newark, N. J., has been incorporated by William H. Craig, East Orange, N. J.; James W. Lindsay, Paterson, N. J., and Edward P. Doane, Newark.

Efforts are being made at Akron, O., according to press reports, to reorganize the old Union Sewer Pipe Co., which formerly controlled the entire sewer pipe output of Summit county, and that the National Sewer Pipe Co. of Barberton, which has always refused heretofore to enter the pool, has now agreed to enter into it.

The Iron City, Rosendale and Cement Co., which will absorb the West Newton Ground Lime & Cement Co., near West Newton, Pa., has applied for a charter. Capitalists of McKeesport, Pa., are interested in the new company. A large plant will be built.

The name of the Watertown Paving Co., Watertown, N. Y., has been changed to the Ironite Concrete Co. When the company first started in business it was confined mostly to sidewalks, but it has since branched out into other lines of concrete, and the former name does not now fully cover its work. The company last year purchased for certain territory Ransome's patents for concrete and twisted steel construction for fire proof buildings and floors, etc. The parties interested in the business

The Southern Tile & Artificial Stone Co., Jacksonville, Fla., has been incorporated. The incorporators are J. K. Munneslyn, F. A. Bays, Jacksonville; J. F. St. John, M. E. Gillett, Tampa, Fla.; D. E. Thompson, L. F. Edwards, B. A. Coachman, secretary, Jacksonville.

The Mexican Clay Manufacturing Co., Cleveland, O., has been incorporated in West Virginia, to manufacture and deal in sewer pipe, paving brick, etc., by W. J. Burke, Charles F. Halsted, George D. Beatty and Remsen Johnson, Brooklyn, N. Y., and Austin Norris, Jersey City, N. J.

Meacham & Wright, Chicago, Ill., have been awarded the contract for furnishing about 250,000 barrels of American natural cement, to be used in the construction of the New Orleans drainage system.

The Alcatraz Asphalt Co. authorizes contradiction of reports that their company has been absorbed by the Trinidad or Bermudez interests. Mr. Barton, the eastern manager of the Alcatraz Co., says there is no foundation for such reports.

The Northwest Development Co., East Orange, N. J., has been incorporated by Charles E. Pigby, jr., and Wentworth B. Winslow of New York City, William Percy Mills, Flatbush, N. Y., and Howard K. Wood, East Orange.

The Keystone Crusher and Roller Co., Pittsburg, Pa., has been incorporated by George T. Robinson, Matilda A. Rea, William H. Rea, Henry Rea, Allegheny, Pa., and Henry H. Robinson and Stuart H. Robinson, Pittsburg.

The American Pavement Repair Co., Chicago, Ill., has been incorporated as manufacturers and contractors, by Edward T. Wray, Homer L. Kraft and Donald M. Carter.

The recently organized Alcatraz Paving Company, 57 E. Fifty-ninth street, New York City, has elected officers as follows: President, Chas. I. Williams, Utica; vice-president, H. M. Gillig, New York City; secretary and treasurer, Frank L. Unger, New York City.

F. W. Cappelen, city engineer at Minneapolis, Minn., favors a municipal asphalt plant.

John C. Griffith, of Buffalo, N. Y., has leased fifteen acres of land from James G. Doty at Utica, N. Y., for a term of years and will build a paving brick plant at once.

The Minneaplis Times urges the utilization of the brick material within the city limits of Minneapolis for the manufacture of paving brick.

The W. S. Dickey sewer pipe works, Deepwater, Kas., were destroyed by fire recently.

The Alcatraz Asphalt Co. is erecting buildings at the wharf site, near Gaviota, Los Angeles, Cal.

The California Asphaltum Co., Ventura, Cal., made its first shipment of asphalt, 88 tons, July 23, to Allegheny City, Pa. The company also has orders for 1,000 tons of asphalt for Pittsburg and 1,000 tons for other eastern points.

The Warren-Scharf Asphalt Paving Co., New York City, has purchased about twenty-five lots on the east side of the Harlem river and will erect manufacturing buildings for its own use.

A sewer pipe, drain tile and brick plant will be put in operation at Ogden, Utah, in which the citizens are asked to take one-fourth the capital stock.

Willis Shaw, 506 New York Life building, Chicago, Ill., has made recent sales of hoisting engines, contractors' locomotives, dump cars and pumps and boilers, to Lantry & Sons, Pontoosuc, Ill.; Peppard & Johnson, Minneapolis, Minn.; Ganahl Lumber Co., Arkansas; Carey Construction Co., Ft. Worth, Tex., and Christie & Lowe, Sabine Pass, Tex.

The American Sanitary Engineering Co., Detroit, Mich., has been incorporated in West Virginia by John and A. J. MacDougall, Montreal, Quebec; H. D. McMillan and F. E. Kirby, Detroit, Mich.; H. W. Avery, Grosse Isle, Mich.

The Inter-State Construction Co., East Orange, N. J., has been incorporated to construct and repair railways, bridges, waters works, etc., by James Kelley and Bernard Mallen, New York, N. Y.; Henry Cleveland, Brooklyn, N. Y.; Alfred Luttman, Newark, N. J.

A relief association has been organized by sixty employes of the Galesburg Paving Brick Co., Galesburg, Ill., and a fund for sick and injured members will be created, the dues to be ten cents a week. The officers of the organization are: President, L. H. Smith; vice-president, Samuel Stone; secretary, O. T. Green; treasurer, Frank H. Parkins; trustees, Thomas Mitchell, Thomas M. Starkey, John Skilley, John McCarr and George Muir. The action results from a number of recent accidents among the employes.

Morris B. Sherrerd, engineer of the board of works, Newark, N. J., has invented a device for cutting a piece out of a large water main, inserting a valve, taking the cut piece of the main out, then slipping a sleeve over the place where the cut was made, and repairing the main without shutting off the water in it. Patents have been secured on the device, which consists of a split casing of cast iron, a cutting machine of steel, a valve and stuffing machine, and a steel sleeve to slip over the place; then a piece of the main is cut out. The cutting apparatus was invented by D. W. French, superintendent of the Hackensack Water Co. A successful test can be made of the device.

SELECTIONS FROM THE PRESS.

HOW SMOOTH STREETS ARE APPRECIATED IN PHILADELPHIA.

Philadelphia wheelmen are sorely disgusted. The cause is very pathetically set forth by the Philadelphia Inquirer as follows: "These glorious days for the coal cart driver, the man who rides on a dray and the push cart vender on North Broad street. For many years these persons have rumbled over cobblestones and Belgian blocks between Vine and Spring Garden streets, but now Councils have had six-foot asphalt paths laid on either side of the highway. Nothing better could have been asked for by the drivers of heavy vehicles. The fact that the paths were made for wheelmen does not worry them in the least. It is a very wide wagon that cannot find plenty of room in a space of this size, and all day long there is a procession of them going north and south, skirting the gutter as they proceed leisurely along. As for the wheelmen, they can take their choice between riding over the stones and being run down. For the first few days after the paths were laid they proved an unqualified success. The big bicycle meet was in progress here then, and bikists pedaled up and down the narrow avenues with impunity. Then the cart drivers discovered that the paths were right good things and they proceeded to take advantage of them. Very few ventured on at first, but the riding was so smooth and the police did not interfere, so others followed, and now the middle of the street is practically deserted."

Thomas L. Hicks, chief of the bureau of highways, in an interview regarding the usurping of the bicycle paths by teams, said: "I knew just how it would be. It was I who proposed the laying of bicycle paths, but I wanted them put in the middle of the street with four feet of blocks between them. Over in New York they have the path along the curbs and the same difficulty is experienced there as here. The wheelmen, however, asked to have the paths placed just where they are and now they must pay the penalty.

"There is absolutely no remedy," continued Mr. Hicks. "An ordinance says that vehicles are to keep to the right of the street and they are simply obeying the law. The business men, also, have a perfect right to have teams standing in front of their establishments. These paths are only temporary, however. Just as soon as the bridge over the subway is completed the blocks and the paths are to be torn up and the whole street will be asphalted."

GREATER NEW YORK'S PAVEMENTS.

New Yorkers who atended the Philadelphia bicycle meet retnrned with praises on their lips for the many miles of asphalted streets they found there. But Greater New York has been also making rapid strides in the way of better street pavements. In eight years, including work contracted for but not completed, over seventy-two miles of streets in the present city have been paved with asphalt. There has also been much done in the direction of macadamizing roads in the upper part of the island and in the Bronx district. Seventh-ave. above the park is now being macadamized, and contracts have been let for making the same kind of road in Boulevard Lafayette. In other parts of New York the same good work is going on. Staten Island is noted for its fine roads. There are fifty miles of macadamized streets there, but contracts have been awarded for macadamizing twenty-three miles more. In Brooklyn, once notorious for its poor pavements, a remarkable transformation is taking place. Many miles of splendid roads have already been finished in the Bay Ridge region and the shore road along the edge of the New York harbor is now being macadamized. A new road is being constructed to Forest park, which, when finished, will make a driveway almost equal to Riverside. Miles of asphalt are also being laid in Brooklyn, and already most of the different parts of the wide territory are connected by lines of asphalt. Jamaica and other outlying towns, which are to come within Greater New York, are also making arrangements for important road improvements. The results of these changes are already apparent. They not only increase the pleasure of drivers and of bicycle riders, but they are making it possible to keep the city cleaner. It costs less to clean asphalt than cobble stones. The greater cleanliness of the city is responsible for the remarkable decrease in the death rate of the past yar. With better streets a cheap cab service is made possible. But noticeable as have been the street improvements, much still remains to be done, and some work that has been finished needs to be done over again because it was done poorly.

The chief lack of New York is the difficulty of getting in and out of it. Only one bridge crosses the East river and none over the Hudson river; but this lack will be filled in a few years. Over the Harlem there are ample bridges, but there are no good roads connecting the best paved streets below the Harlem with the macadam thoroughfares above the Harlem. Brooklyn suffers in the same way. It has only one macadam street connecting with the fine system of Queens county roads, and that has been so poorly made by the contractor that the work needs to be done over again. In the Manhattan and Bronx districts of New York City the plans for new asphalt and some suburban macadam roads call for an expenditure of more than ten million dollars, but the money has not yet been all appropriated for the purpose. The improvements will be made gradually. There is much complaint this summer concerning the delay in completing streets opened for new pavements and for water mains. Residents on Fifth avenue have in particular suffered much and long. There are twenty-four streets being paved, eight being regraded and nine being opened for water mains.—New York correspondence of Philadelphia Ledger, Aug. 12, 1897.

I asked the biker: "Which do you prefer—
A road made of asphalt, or macadam, sir?"
With a humorous twist of the head:
"Asphalty as is oft the judgment I've got,
I think I'm right when I say it does not
Macadam bit of difference," he said.
—New Orleans Times Democrat.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

London, E. C.—The Limner Asphalt Paving Co., Ltd., will take up the wood pavement in Victoria street, Millbank and Chapter streets and relay them with compressed asphalt.

Denver, Col.—The Colorado Paving Co. has proposed to refer the questions involved in the stone cutters' strike on Capitol hill curbing to the state board of arbitration for settlement.

Denver, Col.—The North Side Improvement Society has procured figures relative to the cost of disintegrated granite paving, which shows that it can be laid at a cost of 66 cents a front foot.

Allegheny, Pa.—The ordinance passed by councils for the widening of Arch street has become a law by default, Mayor Geyer having failed to either veto or affirm it within ten days after its passage.

Cincinnati, O.—The specifications for sheet asphalt paving have been amended so as to provide for Trinidad Pitch Lake, Burmudez and Alcatraz asphalt.

Chicago, Ill.—Asphalt filled manhole covers are being used for electric subways in connection with the asphalt paving on Jackson street, which is being paved with asphalt from the river to the lake front, as a continuation of Jackson boulevard.

Chicago, Ill.—The Wabash Improvement Association, which was organized to provide local municipal improvements, is making preparations for cleaning the streets, painting and improving the buildings and shop fronts, and providing arc lamps on the subscription system.

An error in the August number resulting from inadvertent transposition of the type under illustrations made it appear that the asphalt pavement on McPherson avenue in St. Louis was a telford pavement and that the telford on Westminster Place was asphalt. While the mistake was apparent, this explanation is made simply as a correction of record.

Trenton, N. J.—In accordance with instruction from the board of freeholders three suits to recover overpayments made to Robert Montgomery and Charles B. Walton, who built the stone roads, were instituted in the supreme court for $30,000 each. The contractors are willing to refund $7,000, which they concede was overpaid them.

East St. Louis, Ill.—Judge Rhoades, of the county court, is considering the petition of the objectors on several streets where a continuation of street improvements is favored by the citizens and who are anxiously awaiting his decision. Objection to the assessment is made on a technicality in the ordinances ordering the improvement.

Ft. Madison, Ia.—Mayor J. A. Jordan, Alderman C. D. Diederick, City Treasurer A. Camirer and City Engineer J. Ross, visited Galesburg, Ill. Aug. 16 to inspect the single course brick pavement laid in that city. This city contemplates paving some this year in conjunction with the county, which will pave one of the country roads leading out of the city.

Minneapolis, Minn.—F. W. Cappelen, city engineer, favors municipal maintenance of asphalt pavements for a large corporation having a considerable and increasing quantity of asphalt, and believes that a large city would find it advantageous to equip a first-class asphalt plant, buy the raw material in the open market and construct and maintain its own pavements.

Richmond, Tex.—The Madison county fiscal court has approved the purchases of turnpikes, amounting to $38,000, and the gates on the pikes will be ordered removed. The principal purchases are the Richmond and Lexington pike, eleven miles long, $12,000; the Richmond and Irvine pike, eleven miles, $8,000; the Richmond and Big Hill pike, fifteen miles, $11,000, and the Richmond and Barnes-Mill pike, five and a half miles, $5,000.

Richmond, Va.—The foundation in the Hull street paving has not been made sufficiently solid and the paving stones have sunk several inches all along the line except where laid on the sills, giving the road a very rugged appearance, besides being a source of great danger. Most of the work will have to be done over. The contract between the city and the contractors places upon the contractors the responsibility of keeping the street in thorough repair for twelve months after their work is finished, and after that time the duty will devolve upon the railroad company.

Atlanta, Ga.—Mayor Collier, mayor pro tem. W. R. Dimmock, Alderman I. S. Mitchell, Geo. P. Howard and L. P. Stephens, W. E. Anderson of the street committee, City Engineer R. M. Clayton and Commissioner of Public Works D. G. Wylie visited Norfolk, Va., Aug. 9 to inspect the street pavements of that city, where seaweed and other paving material has been tested recently, with a view to adopting permanent material for use.

Toledo, O.—Mayor Kirk, councilman from the Tenth ward, has prepared an ordinance to provide for putting in sewer, water and gas connections to the curb before a street is paved, and in case of the necessity for breaking into a pavement at any time, requiring a deposit of enough money to put it back in as good shape as before, if the person permitted to open it should fail to do so. The connections shall be made within a certain time, after a proclamation to property-owners from the mayor, or the city will do the work and charge the cost to the property.

Winona, Minn.—Considerable prejudice existed among some of the citizens of Winona, Minn., before the work of macadamizing Broadway street began, because of the narrow width of the roadway. The full width of the street is 100 feet, but only thirty-five feet of the roadway is being macadamized except at intersecting streets, where it is extended to 100 feet. As the work of

macadamizing progresses, however, and there is an opportunity of judging of what the appearance of the street will be when finished, prejudice is giving way and the property-owners have begun to make the boulevards in front of their homes conform to the new grades and are sodding or planting grass seed. The Winona Construction Co. has the contract for macadamizing the street for a distance of twelve blocks.

New York, N. Y.—(Special.)—The final estimate for 1897 of the City of New York amounts to $49,486,297.17 and the appropriations to several of the departments is as follows: Department of public works, $3,519,555.66, including for repairs and renewals of pavements and regrading $300,000, and for repaving streets and avenues $225,000; department of public parks, $1,333,125; department of street cleaning, $2,999,002.40, itemized as follows: Administration, $210,000; sweeping, $1,361,129; carting, $897,833; final disposition of material, including cremation and utilization, $375,000; rents and contingencies, $104,340; removal of snow and ice, $40,000; new stock plant, $10,000.

Detroit, Mich.—Commissioner Moreland of the board of public works is in receipt of a letter from City Surveyor Spencer Harty of Dublin, Ireland, in which he says: "The various kinds of pavements used on our streets and thoroughfares consist of square set wood, asphalt and macadam. The most durable, as well as the most sanitary, are square set and asphalt. The cost of the different pavements is as follows: Square set, 12s per yard; wood, 12s; asphalt, 11s; macadam, 4s per yard for new and 1s 9d for repairs. The price of cement is given at 36s per ton; gravel, 4s per ton; asphalt, 54s per ton, and bitumen, £10."

Detroit, Mich.—The board has decided to request Health Officer Duffield to make an analysis of all asphalt as it arrives in the city, and to accept Commissioner McVicar's specifications for artificial stone sidewalks, which requires contractors to put up bonds in the board of public works office, guaranteeing any sidewalk that they may lay to last at least five years.

CONTRACTS TO BE LET.

Findlay, O.—Bids will be received until Sept. 2 for constructing sidewalks.

New London, Conn.—Bids will be received until Sept. 4 for improving Ocean avenue. George Crandall, city surveyor.

Spencer, Ind.—Sealed bids will be received until Sept. 10 for constructing pike roads. Joseph B. Wookman, county auditor.

Madisonville, O.—Bids are asked until Sept. 4 for macadamizing Central and Bramble avenues. Bennett Carter, village clerk.

Bryant, Ia.—Sealed bids will be received until Sept. 6 for macadamizing certain roads. George J. Ingwerson, township clerk.

Cleveland, O.—Bids are asked until Sept. 2 for paving a portion of Woodland court with brick. George R. Warden, director public works.

Mason City, Ia.—Bids will be received until Sept. 4 for brick paving on concrete, with cement grout filler.

Vernon, Conn.—Sealed proposals will be received until Sept. 4 for macadamizing a section of Talcottville road.

Darby, Pa.—Bids are asked until Sept. 4 for macadamizing Pine street, and for granite block paving on Main street. C. E. Drewes, chairman highway committee.

Kewaunee, Wis.—Sealed proposals will be received until Sept. 7 for improving Milwaukee street, from Ellis to Center street. John Poser, city engineer.

Tuscumbia, Ala.—According to press reports bids will probably be asked until Sept. 4 for the construction of additional macadam roads for Colbert county.

St. Paul, Minn.—Sealed bids will be received until Sept. 2 for repaving with macadam and brick Hill and Washington streets. John Copeland, president board of public works.

Spokane, Wash.—Mayor Olmstead signed the ordinance providing for brick paving on Howard street Aug. 16 and bids will probably be asked in September for the work.

Mansfield, O.—Sealed proposals will be received until Sept. 4 for improving Park avenue, from Brinkerhoff avenue to Sherman-Heineman Park, and Plumb alley, from Main to Diamond street. F. H. Remy, city clerk.

Denver, Col.—Bids will be received until Sept. 14, for paving and curbing Colfax avenue, to Welton street; Welton street, to Twentieth and Cheyenne street; Colfax avenue, from Broadway to Evans street, and Cleveland place and Upper Seventeenth street. Board of public works.

Cincinnati, O.—Sealed proposals will be received until Sept. 7 for paving with brick and curbing Winslow avenue, from Crown to Oak; until Sept. 8, for paving Carrie street, with brick; until Sept. 15, for macadamizing Highland avenue. Aug. Herrmann, president board of administration.

Irvington, Ind.—Sealed proposals will be received until Sept. 7 for paving with cement the sidewalk on the east side of Ritter avenue. Bids will be received until Sept. 13 for a cement sidewalk in Grand avenue, from Irving to Beechwood avenue, and Maple avenue from Washington street to a point 927 feet southwest. W. C. Smith, town engineer.

CONTRACTS AWARDED.

Davenport, Ia.—Louis Neumann was awarded contracts Aug. 16 for macadamizing two roads.

Wauwatosa, Wis.—The contract for macadamizing Vliet street was awarded to A. S. Mangold at 85 cents a cubic yard.

Pembrook, Pa.—The contract for grading and improving Main street has been awarded to Joseph Bomgardner for $4,400.

Marion, O.—The contract for macadamizing Bellefontaine avenue was awarded Aug. 10 to J. H. Dwyer for $7,182.20.

Middletown, Conn.—McDonald & Hennessey were awarded the contract Aug. 16 for macamadizing the Durham turnpike at 98 cents a lineal foot.

Freedom, Pa.—The contract for paving one mile of brick paving was awarded to Dager & McKinney of Canton, O., Aug. 4 for $15,729.

Rochester, N. Y.—The contract for paving Lake View Park with Hayden block was awarded to H. B. Hooker Aug. 6 for $14,769.75.

Troy, N. Y.—Casey & Cavanaugh secured the contract for paving Eighth street, from Hoosick to N. Adams street, with Canton brick for $6,523.

Cleveland, O.—The contract for paving Hickox street has been awarded to the

Ayres Asphalt Co., Zanesville, O., at $1.99 a square yard.

Newton, Ia.—The Edwards & Walsh Construction Co., Davenport, Ia., was awarded the contract Aug. 2 for brick paving at $1.47 a square yard.

St. Charles, Mo.—The contract for paving Main street with brick was awarded to Dr. Budd of St. Louis, Mo., at $3 per front foot.

Quincy, Ill.—Ignatz Zengel secured the contract Aug. 17 for grading Locust boulevard and building a telford road at 90 cents a cubic yard.

Marshalltown, Ia.—The contract for paving S. Main street with brick was awarded to J. F. Atkinson & Bro. of this city at $1.25 a square yard.

Albany, N. Y.—The contract for paving Elk street, from Quail to Ontario, with brick, was awarded to Edward F. Dillon Aug. 16 for $6,930.90.

Revere, Mass.—The contract for constructing Campbell avenue was awarded Aug. 17 to H. C. Watson and O. Dockendorff of Reading, Mass., for $1,200.

Jamestown, N. Y.—The contract for 11,035 square yards of brick paving and sewers and appurtenances was awarded Aug. 9 to Prout & Swanson for $18,557.

Milwaukee, Wis.—The contract for grading and improving Burleigh street, from Third street to Louis avenue, was awarded Aug. 3 to A. Kellner for $14,356.

Albany, N. Y.—J. Henry Dumary secured the contract for paving the viaduct and approaches to the Knox street viaduct Aug. 6 for $6,635.90.

Rockville, Ind.—The contract for building the O. P. Brown gravel road was awarded Aug. 12 to Edward Bradfield and V. V. Nowling for $6,006.42.

Hudson, Wis.—The contract for constructing 3,000 square yards of asphalt sidewalks has been awarded to Andy Hoban, of the St. Paul Sidewalk Co., St. Paul, Minn.

Dubuque, Ia.—The contract for paving Iowa street, from Seventh south, with brick, was awarded Aug. 18 to Mephoale & Mead, of Rockford, Ill., for $8,824.

Pittsburg, Pa.—Bids were received Aug. 19 for improving the Verona road from two companies. The bid of C. I. and A. W. McDonald seemed to be the lowest.

Harrison, N. J.—Green & Tierney secured the contract Aug. 17 for repaving Harrison avenue, from Bridge street to the Kearney line, for $5,306.46.

Bridgeport, Conn.—The contract for paving Main street, from Congress street to Bull's head, 5,300 square yards, was awarded Aug. 19 to Silliman & Godfrey at $2.24 a square yard.

Binghamton, N. Y.—The Utica Paving Co. was awarded the contract Aug. 18 for paving Main and Washington streets with asphalt, at $1.59 a square yard, on a five-year guarantee.

Hamilton, Ont.—The Kramer-Irwin Paving Co. was the only bidder recently for paving McNab avenue at $2 a square yard for vitrified brick paving and $2.15 a square yard for asphalt.

Jeffersonville, Ind.—The contract for paving Spring street with vitrified brick, granitoid sidewalks, and sewerage, was awarded July 30 to W. O. Sweeney & Co. for $24,119.90.

Pittsburg, Pa.—A. W. and C. I. McDonald were awarded the contracts Aug. 3 for improving Washington and Butler roads for $20,000 each, and the Braddock road for $10,000.

Hughestown, Pa.—The contract for paving Washington terrace was awarded to Gottlieb Smaltz, Aug. 2, at 40 cents a square yard for paving and 20 cents a lineal foot for grading.

Buffalo, N. Y.—Bids have been received for paving Landon and Chenango streets, which range in price from $5,228 to $6,103 for Landon street, and from $7,136 to $8,938 for Chenango street.

Holyoke, Mass.—The contract for laying the brick paving on Cabot street was awarded Aug. 18 to W. R. Johnson, Steubenville, O., at 73 cents a square yard. The city will furnish the brick.

Bluffton, Ind.—The Indiana Bermudez Paving Co., Indianapolis, was awarded the contract Aug. 7 for asphalt paving at $1.87 a square yard, and W. F. Ruddle, Kokomo, for brick paving, $1.65 a square yard.

Hamilton, O.—B. D. Bartow was awarded the contract Aug. 9 for paving Main street, from A to Millville avenue, with asphalt blocks, on broken stone, concrete and cement curbing, for $35,782.

Newton, Ia.—The contract for brick paving has been awarded to the Edwards-Walsh Construction Co. of Davenport, at $1.47 a square yard, and for curbing to Peter Nelson of this city at 38 cents a lineal foot.

New York, N. Y.—The Warren-Scharf Asphalt Paving company presented the lowest bid Aug. 10 for macadamizing the Boulevard Lafayette, from One Hundred and Fifty-Seventh street to Kingsbridge road, which was $1.16 a square yard.

Boston, Mass.—Contracts have been awarded for the construction of highways as follows: Wenham, A. J. Wellington, Boston, $4,762; Bedford, W. H. Mague, West Newton, $4,320.55; Bowen, W. H. Mague, West Newton, $2,323.50.

Pittston, Pa.—The Keystone Paving Co. was awarded the contract Aug. 6 for asphalt paving at $2.23 a square yard for paving and 40 cents a lineal foot for curbing.

Port Huron, Mich.—The contract for repaving Military and Water streets with brick was awarded Aug. 10 to Laidlaw Bros., of Detroit. Jacob Miesner & Co. of this city secured the contract for repaving Pine Grove avenue with cedar blocks.

South Bend, Ind.—The contract for paving E. Wayne street with vitrified brick was awarded to C. H. Defrees Aug. 9 at 80 cents a square yard for Brazil (Ind.) repressed brick; 14 cents a lineal foot for cement curb; 14 cents a cubic yard for grading to sub-grade.

Indianapolis, Ind.—The contract for paving Court street, from East to Liberty, with brick on concrete, was awarded Aug. 23 to J. K. Cooper at $2.09 a foot; first alley north of St. Clair street, from Ft. Wayne avenue to New Jersey street, G. W. McCray, $1.14 a yard.

New Philadelphia, O.—The contract for 9,000 square yards of brick paving was awarded to John Hadley, Canton, O., at 79 cents a square yard, and the curbing to Shill & Gintz, of this city, at 22 cents a lineal foot for new 18-inch curbing, and 11 cents for resetting old curbing.

Columbus, O.—Contracts were awarded

July 26 for block and asphalt paving as follows: Hamilton avenue, resurfacing with asphalt, Warren-Scharf Asphalt Paving Co., $5,460; State street, macadam, D. E. Sullivan, $1,048; Elm street, Buckeye paving block, Henry Gantz, $831.50.

Allegheny, Pa.—The contract for paving California avenue, from Sedgwick street to Island avenue, was awarded Aug. 10 to Booth & Flinn for $6,133. The committee of public works also recommended that a contract be awarded to the Wadsworth Stone & Paving Co. for $4,672.

St. Paul, Minn.—Fielding & Shepley secured the contract Aug. 7 for paving with sandstone Broadway, from Third to Seventh, for $9,470. The Warren-Scharf Asphalt Paving Co. was awarded the contract for the block in front of the Northern Pacific general offices on Broadway for about $2,600.

Sedalia, Mo.—The contract for paving Sixth street with asphalt was awarded Aug. 16 to the Gilsonite Roofing and Paving Co. of St. Louis, at $2.15 a square yard for paving and 55 cents a lineal foot for curbing. The Rock Creek Natural Asphalt Co., Topeka, Kas., bid $2.24½ a square yard for paving.

Decatur, Ill.—The Warren-Scharf Asphalt Paving Co. was awarded the contract Aug. 2 for paving W. North and N. Main streets with asphalt at $1.68 a square yard. The Indiana Bermudez Co. bid $2.15 on each street and the Ayres Asphalt Co. $2.22 on W. North street, and $2.24 on N. Main street.

Davenport, Ia.—The Flick & Johnston Construction Co. presented the lowest bid Aug. 10 for paving Perry street between Twelfth and Fourteenth. The company's bid was: Excavation, 30 cents a cubic yard; Purington brick, $1.29 a square yard; Buffalo brick, $1.22 a square yard; curbing, 35 cents a lineal foot; tile, 9 cents a lineal foot.

Evansville, Ind.—The contract for paving Maryland street, from Fulton avenue to Grove street, with brick, was awarded, Aug. 14, to Bedford, Weikel & Nugent at the following prices: Middleport brick on stone concrete, $1.67 a square yard; concrete, $1.55; curbing, 49 cents a lineal foot; round corners, $1; total $18,018.

Louisville, Ky.—Contracts were awarded, Aug. 6, for street construction as follows: Burnett avenue, vitrified brick, M. Lawler & Son, $16 per 100 square feet; Twenty-second street, vitrified brick, L. R. Figg, $17.50 per square; alley, Wm. H. Bates, $14.50 per square; alley, Urban Stengel & Son, $14.20 per square.

Hartford, Conn.—The Hartford Paving & Construction Co. was awarded the contract for paving Asylum street with asphalt blocks at $3.14 a square yard. Bids have been received for paving Church street, from Main to Trumbull, as follows: Southern New England Paving Co., $2.59 a square yard; Boston Asphalt Paving Co., Sicilian sheet asphalt, $2.93 a square yard.

Milwaukee, Wis.—The Western Paving & Supply Co. was awarded contracts Aug. 9 for asphalt paving as follows: Prospect avenue, from Juneau avenue to Albion Place, $2.12 a square yard; Marietta avenue, from Folsom Place to Linwood avenue, $2.05. J. S. O'Neill secured a contract for laying a cement sidewalk on Maryland avenue, form Park Place to Newbury boulevard, at 84 cents a lineal foot.

Duquesne, Pa.—The contract for grading, curbing and paving Duquesne avenue was awarded to J. H. Wertenbach, of McKeesport, at 29 cents for excavation, 43 cents for curb dressed, 32 cents for curb rough, and 99 cents for paving. The work includes 10,000 cubic yards excavation; curb, dressed, 8,600 lineal feet; curb, rough, 250 lineal feet; vitrified brick paving, on gravel and sand foundations, 9,000 square yards.

Grand Rapids, Mich.—Paving contracts were awarded Aug. 3 as follows: Lake avenue, from Fuller street to Wealthy avenue, brick, Leonard Schneider, $16,440; South Division street, from Burton avenue to railroad track, Sullivan & Higgins, $11,000; North Ionia street, from Pearl street to Crescent avenue, asphalt, H. M. Reynolds, $6,215; Fountain street, from Ottawa to Division, Warren-Scharf Asphalt Paving Co., $3,220; Madison street, from North avenue to Union street, Leonard Schneider, $4,063.

Brooklyn, N. Y.—The Fruin-Bambrick Construction Co. presented the lowest bid Aug. 16 for paving Jamaica avenue, from Pennsylvania avenue to the city line, with asphalt on concrete, and curbing and guttering, for $59,987.60. Cranford & Co. were the lowest bidders for blue stone curbing, at $57,695.85. This was the second time bids were received for this work, the first set being rejected because the lowest bid exceeded the appropriation.

Philadelphia, Pa.—Bids were received Aug 13 for improving Wharton square, as follows: The Vulcanite Paving Co., $18,052.50; the American Artificial Stone Pavement and Construction Co., $15,000, and James H. Shea, $14,175; J. L. Clymer, for cement work, $6,129; William Chambers, for grading, sodding and erecting flag pole, $4,000, and the Pennsylvania Paving and Improvement Co., for cement work and plumbing $8,687.

St. Louis, Mo.—Bids have been received for curbing, guttering, etc., as follows: For repairing gutters, curbs and crosswalks with limestones within the First district, G. Eyermann, jr., $3,698; Second district, Bambrick-Bates Construction Co., $4,639; Third district, Stifel & Ruckert, $2,799. For constructing new crosswalks of limestone or vitrified brick within the First district, John A. Lohrum, $739; Second district, Skrainka Construction Co., $1,894; Third district, Bambrick-Bates Construction Co., $720.

Bloomington, Ill.—Paving contracts have been awarded as follows: J. Cherry, 2,128 square yards brick, 1,320 feet curb, $2,875; intersections, 1,204.5 square yards brick, 409.5 feet curb, $1,640; residue, 7,488.5 square yards brick, $2,050; 5,052.5 feet curb, $9,050; intersections, 530 square yards brick, 166 feet curb, $600; residue, 4,629 square yards brick, 2,083 feet curb, $6,400; intersections, 232.5 square yards brick, 42 feet curb, $320; street car tracks, 288 1-3 square yards, $450; residue, $2,300.

Saginaw, Mich.—The board of public works awarded the contract for paving Jefferson avenue to the Barber Asphalt Paving Co. at $1.49 a square yard for paving and 4 cents a square yard per year for maintenance for the second five years. The Columbus Construction Co. bid $1.54 a square yard and 5 cents per year for maintenance, and C. I. Williams of the Utica Paving Co. bid $1.48 a square yard and 4 cents per year for maintenance. The city has a saving of $10,000 by rejecting the first bids received and readvertising.

Hoboken, N. J.—(Special)—The common council has awarded to the Utica Paving Co. a contract for laying 30,000 yards of asphalt on Garden Street, fifteen blocks from Ferry street, to Fifteenth street. A second contract about the same amount was awarded to the New Jersey Mexican Asphalt Company, for the improvement of Hudson and Eleventh streets and Willow avenue in front of public school No. 6. Both contracts call for asphalt to be laid over the present Belgian blocks, at a cost of $1.23 per yard.

Hamilton, O.—Bids were received Aug. 21 for paving S. Third street with asphalt, asphalt blocks or brick. The bid of the Warren-Scharf Asphalt Paving Co. for sheet asphalt or that of W. N. Andrews for asphalt block will probably be accepted. No bids were submitted on brick. The Warren-Scharf Asphalt Paving Co.'s bid was: Sheet asphalt, limestone curb, $22,449.40; cement curb, $21,086.40. W. N. Andrews: Asphalt blocks, concrete base, limestone curb, $24,644.60; cement curb, $23,262.60; gravel base, limestone curb, $23,582; cement curb, $23,200.

Toledo, O.—John C. Carland was awarded contracts Aug. 5 for paving with Metropolitan block, with Medina curbing, as follows: Alley between Front and First streets, $665.15; Twentieth street, from Machin to Monroe, $4,424.36; Union street, from Beaver to Bancroft, $2,376.40. The Warren-Scharf Asphalt Co. secured the contract for paving Lawrence avenue at $1.97 a square yard. J. C. Carland was awarded the contract Aug. 16 for paving Shaw avenue with Athens block, with Berea curb, for $4,258.63, and H. P. Streicher secured the contract for paving Bush street with Nelsonville block for $6,019.30.

Buffalo, N. Y.—The Utica Paving Co. was awarded the contract Aug. 12 for paving Jefferson street with asphalt for $47,690. Bids were received some time ago for paving this street, and the Utica Paving Co. presented the lowest bid, but protests were made against accepting its bid on the ground of its being informal. The other bids received Aug. 12 were as follows: P. B. McNaughton, any brick, $53,694; Barber Asphalt Co., Trinidad asphalt, $49,995; Columbia Construction Co., Trinidad asphalt, $58,245; German Rock Asphalt & Cement Co., Trinidad asphalt, $69,990.

Peoria, Ill.—(Special.)—A. D. Thompson, city engineer, says the contract for 7,400 square yards of asphalt paving and 4,000 lineal feet of curb and gutter on Ravine avenue was awarded to the Warren-Scharf Asphalt Pacing Co. of New York City at the following prices: Excavation, 30 cents a cubic yard; protection curb, 6 cents a lineal foot; combined curb and gutter, 79 cents a lineal foot; asphalt, $1.85 a square yard. The pavement will consist of two and one-half inches wearing surface of asphalt on a six-inch concrete foundation. S. H. Taylor, New York City, bid as follows: Excavation, 30 cents; protection curb, 6 cents; combined curb and gutter, 80 cents; asphalt, $1.87.

New York, N. Y.—Bids were received Aug. 12 for paving Jerome avenue and contracts were awarded as follows: First section, brick, 10,400 square yards, J. C. Rodgers, 532 W. One Hundred and Fifty-second street, $26,832; second section, macadam on telford foundation, 44,550 square yards, Thileman & Smith, S. One Hundred and Twenty-fifth street, $47,223; third section, macadam on telford foundation, 52,800 square yards, William H. Masterson, 231 E. Eighty-sixth street, $62,450. The Barber Asphalt Paving Co. secured the contract for paving Boston road, from E. One Hundred and Sixty-eighth street to Jefferson Place, and E. One Hundred and Sixty-ninth street, from Boston road to Franklin avenue, for $35,631.30.

Floral Park (L. I.), N. Y.—The contract for macadimizing the Flushing and Newton causeway, from the Flushing bridge to Hill's creek, was awarded to E. Eugene Egler, New York City, for $42,740.50. Bids were received for paving Myrtle avenue, from the Brooklyn city line to Richmond Hill, with new or second-hand granite blocks. The bids were laid over and a committee, consisting of Supervisors Berenel, Dunton and Koofman, was appointed to examine the second-hand blocks which M. J. Dady of Brooklyn and O'Brien Bros. of New York City proposed using. The work includes 26,500 cubic yards of embankment, 54,500 square yards of granite block paving, 50,500 pounds of iron pipe culvert and ten catch-basins.

Minneapolis, Minn.—Bids were received Aug. 19 for paving Nicollet avenue, from Tenth to Thirteenth, with brick, from two firms, the Des Moines Brick Manufacturing Co., $1.98, and Canney Bros., $1.99 a square yard. A petition was presented at the same meeting, signed by property-holders on Nicollet avenue, representing 1,623 feet frontage, asking for asphalt paving instead of brick. Bids were also received for the third time, for paving Seventh street, from Seventh avenue south to Hennepin avenue, with brick. Only two bids were received, John W. Fleetham $2 and the Des Moines Brick Manufacturing Co. $1.99 a square yard. The bids were rejected and the city engineer directed to go into the open market and buy the material and have the work done by the day.

Omaha, Neb.—Bids were received Aug. 10 for paving the northwest road from seven firms. The bids are per running foot of roadway, sixteen feet wide, and are as follows: Van Court & Winn—Brick: Class A, $2.96; class B, $2.93. Macadam: Class A, $1.65; class C, $1.27; with special specifications, using gravel binder, $1.58 and $1.19. Omaha Brick and Construction Co.—Brick: Class A, $2.80; class B, $3.15; class C, $2.95. Macadam, Sherman granite: Class A, $2.85. Colorado sandstone: Class A, $4.45; class B, $4.20. Grant Paving Co.—Menominee Falls stone, $3.82. Macadam, Sherman granite, $1.91. William Finch—Brick: Class A, $2.69; class B, $2.57. Macadam, Sherman granite: Class A, $2.05; class B, $1.98. Hugh Murphy—Colorado sandstone: Class B, $3.50. A. Stutzer—Colorado sandstone: Class B, $3.40. Des Moines Brick Manufacturing Co.—Brick: Class A, $2.83.

Indianapolis, Ind.—Paving contracts have been awarded during August as follows: Aug. 17, Indiana Improvement Co., cement walks on Union street, $1.13 a lineal foot. City Construction Co., cement walks on North street, from Meridian to Senate avenue, 83 cents a foot for seven-foot walks, 36 cents for three-foot approaches and 13 2-3 cents for sodding the lawns between the walks and the property line. Aug. 18, gravel-

ing, curbing and cement walks, Sheldon street, City Construction Co., $1.49; cement walks, Nineteenth street, Indiana Improvement Co., $1.07; Washington street, Browder & Shover, 66 cents; Meridian street, Vermont to St. Clair, City Construction Co., $1.06; St. Clair to Pratt, Capitol Paving and Construction Co., 81 cents; Pratt to St. Joseph, City Construction Co., 95 cents; St. Joseph to Sixteenth, Capitol Construction Co., $1.06; Sixteenth to Twenty-first, Capitol Paving and Construction Co., 80 cents.

Camden, N. J.—Bids were received Aug. 16, for 91,320 square yards of paving. Aaron Ward presented the lowest bid on all the streets for sheet asphalt by 23 cents where a 15-year guarantee was required, with the exception of one street on which he was the lowest bidder by five cents. Richardson & Ross of Philadelphia presented the lowest bid on a ten-year guarantee, being 8 cents lower than Aaron Ward, and this firm was also the lowest on a 5-year guarantee. B. F. Sweeten & Son was the lowest bidder for Belgian block paving on all streets. The bids received were as follows: Richardson & Ross—Trinidad land asphalt, 5 years, $1.50 a square yard; 10 years, $1.69; 15 years, $2.50; Belgian block, $1.98; vitrified brick, $1.60. Pennsylvania Asphalt Paving Co.—Bermudez asphalt, 5 years, $1.70; 10 years, $1.90; 15 years, $2.75; brick, $1.92. Alcatraz Paving Co.—California asphalt, 5 years, $1.73; ten years, $1.78; 15 years, $2.48; Belgian block, $2.63; brick, $1.53. Vulcanite Paving Co.—No. 1 Trinidad Lake asphalt, 5 years, $2.10; 10 years, $2.20; 15 years, $2.80; No. 2 land asphalt, $1.56; No. 3 vulcanized asphaltum, 5 years, $1.51; 10 years, $1.80; 15 years, $2.50; Belgian block, $2.80; brick, $1.90. W. S. P. Shields—Sicilian asphalt, 2½ inches, 5 years, $1.55; 10 years, $2.83; 15 years, $3.23; compressed asphalt, 2 inches, 5 years, $2.30; 10 years, $2.58; 15 years, $2.98; Belgian block, $2.52¼; brick, $1.67. Michael O'Rourke—Asphalt, 5 years, $2.25; 10 years, $2.60; 15 years, $3; Belgian block, $2.09; brick, $1.80. Aaron Ward—Asphalt, 5 years, $1.55; 10 years, $1.77; 15 years, $2.27; Belgian block, $1.91; brick, $1.41. These prices were submitted on all the streets but Cooper, which was as follows: 5 years, $1.73; 10 years, $1.99; 15 years, $2.45; Belgian block, $2.09; brick, $1.71. Ruch & Verhan—Belgian block, $2.27. B. F. Sweeten & Son—Belgian block, $1.86. Action on these bids was deferred until Aug. 23. The contract for paving Second street, from Erie to Burns, with Belgian block, was awarded to B. F. Sweeten & Son at $1.10.

CONTEMPLATED WORK.

Ashland, O.—Brick paving is contemplated for Main street next year.

Lincoln, Neb.—Commissioner Miller is in favor of repaving with asphalt.

Elkhart, Ind.—The property-owners have petitioned for the paving of Division street.

Independence, Mo.—An ordinance was passed Aug. 17 for macadamizing S. Noland street.

St. Louis, Mo.—Ordinances were recommended Aug. 17 for improving nine new streets.

Orleans, Ind.—Orleans township voted Aug. 10 to build twenty-nine miles of macadamized roads.

St. Joseph, Mo.—Asphalt paving is proposed for N. Third street, from Jule to Franklin street.

Monroe, O.—The question of paving two streets is being agitated, according to press reports.

Omaha, Neb.—Final ordinances were passed Aug. 18 for repairing S. Sixteenth street, from California to Cumming.

Riverton, Pa.—An ordinance for the improvement of the streets will probably be passed before the first of December.

New Rochelle, N. Y.—The question of expending $25,000 for improving the streets has been favorably voted on.

Sedalia, Mo.—An ordinance has been passed for paving Kentucky avenue, from Seventh to Broadway, with vitrified brick.

Rochester, N. Y.—Ordinances were introduced in the common council Aug. 18 for an asphalt or Medina block pavement on N. Main street.

Columbus, Ind.—The city council passed an ordinance Aug. 19 for repaving Washington street and several cross streets with asphalt.

Des Moines, Ia.—A resolution has been passed for paving Twelfth street, from Woodlawn avenue to High street, with vitrified brick on concrete.

Allentown, Pa.—An ordinance has been introduced increasing the bonded debt of the city $30,000 to lay sewers, pave Lincoln street, etc.

Paterson, N. J.—Asphalt paving is proposed for Colt, Hamilton, Ellison, Van Houten, Church and Broadway streets, and Belgian block for Market street.

Nashville, Tenn.—A petition has been presented to the city council requesting that Lamar street, from Grand avenue to Edgehill avenue, be macadamized.

Middletown, O.—An ordinance was passed, Aug. 20, for paving Third street, from the Miami river to Clinton street, with vitrified brick.

Camden, N. J.—(Special.)—A petition has been presented to the city council asking to have Market street, from Delaware avenue to Federal street, paved with asphalt.

Mattoon, Ill.—(Special.)—A. C. Loomis, city engineer, says a petition is being circulated among the property owners in Essex avenue for about a mile of asphalt paving.

Denver, Colo.—The Board of Public Works approved a petition from the property owners, Aug. 17, for grading, paving and curbing Sixteenth street, from Wazee to Wewatta.

Detroit, Mich.—The Board of Public Works and the Board of Health recommended, Aug. 16, that the council order a number of alleys paved with asphalt and brick on concrete.

Rochester, N. Y.—The property owners have petitioned for an asphalt pavement on Court street, between St. Paul and Clinton, instead of Medina block, for which an ordinance has been adopted.

Los Angeles, Cal.—The property holders on Figuerda street, between Sixth and Pico, are in favor of improving the street by making a 4-foot asphalt gutter on each side with cement gravel between.

Westport, Mo.—Ordinances were passed, Aug. 16, for asphalt paving on Thirty-second and McGee streets. A resolution was adopted for paving Springfield avenue, from Main to Holmes street, with asphalt.

Newark, N. J.—Notice of intention has been published for the proposed paving, with

oblong granite blocks, of Market street, Brientnall place, Bank street, Wallace place, Warren street, Badger avenue and Browne street.

Buffalo, N. Y.—The Board of Public Works has recommended that the stone pavement on Huron street, between Prospect and Delaware avenues, be covered with asphalt in order to relieve the congested condition of Chippewa street.

St. Paul, Minn.—The Board of Public Works decided Aug. 19 to report to the council a final order for paving Laurel avenue and Dale streets with asphalt, but the contract is not to be let earlier than Feb. 15, 1898.

Moline, Ill.—Fifth avenue, from Seventh street east, will probably be macadamized. A petition was filed with the Board of Public Works Aug. 4 asking that Fourteenth street, from Fourth avenue to Seventh, be paved with brick.

Chicago, Ill.—Petitions have been presented for asphalt paving on Ashland, Lawndale, Sunnyside, Armour and Berenice avenues, Seventy-fifth street and Greenwood terrace; macadam on E. Ravenswood Park and McAuley avenue and cedar block on an alley.

Milwaukee, Wis.—The Common Council passed resolutions Aug. 16 for laying permanent pavements on Prospect avenue, from Albion street to Kane place; Third street, from Ward bank to Chestnut street; Sixth street, from Grand avenue to Clyburn; Wells street, from the river to Third street.

New York, N. Y.—(Special.)—The L. A. W. has secured from the Department of Public Works permission to pave William street, from Cedar to Liberty street, with asphalt. The work will be done at the expense of a number of people who are interested in better paved streets.

Minneapolis, Minn.—Estimates have been submitted by the city engineer for paving Washington avenue, N., from Thirty-second to Forty-second street, as follows: Vitrified brick, $1.90, or total $51,965; Kettle river sandstone, $2.10, or $51,965; granite, $2.25, or $61,537; macadam, 80 cents, or $21,880.

Boston, Mass.—The street department contemplates improving the following streets: Roxbury, Mayfair street; city proper, Massachusetts avenue (easterly side), Columbus avenue to Tremont street; North street, Merchants' Row to Union street; Paul street, Pelham street, Benj. W. Wells, superintendent of streets.

Brooklyn, N. Y.—The common council has declared its intention to repave with asphalt Linwood street, from Jamaica avenue to New Lots avenue; Wyona street, from Jamaica avenue to Pitkin avenue; Hendrix street, from Jamaica avenue to Pitkin avenue. Trap block paving, Prospect Place from Eastern Parkway to Rockaway avenue. Schenck avenue, from Atlantic avenue to New Lots avenue.

St. Louis, Mo.—The board of public improvements has approved ordinances for the reconstruction of streets as follows: Granite, Pestalozzi street, between Broadway and Michigan, and O'Fallon, between Broadway and Seventh; granitoid, alley between Seventh and Eighth, and Pine and Olive streets, and sidewalks on Twelfth, between Market and St. Charles.

New York, N. Y.—C. H. T. Collis, commissioner of public works, sent to the board of estimate and apportionment Aug. 29 a recommendation that asphalt paving be constructed on Broadway, from Forty-seventh to Forty-eighth streets. The estimated cost is $70,000. Commissioner Collis will probably recommend later asphalt paving for several blocks more on Broadway below Twenty-second.

Reading, Pa.—(Special.)—Ordinances introduced to pave with Trinidad pitch lake asphalt or Bermudez asphalt Perkiomen avenue, from Eleventh to Thirteenth street, and Fifth street, from Penn to Pine street, proposals to be on a maintenance and guarantee of ten years. There was some discussion in favor of brick, but asphalt was decided upon because of ten-year guarantee and cheaper in the end.

Indianapolis, Ind.—Resolution were adopted Aug. 24 for cement walks on New Jersey-st., from Thirteenth to Sixteenth; macadamizing Capitol avenue, from Twenty-first street to a point 633.4 feet north of Twenty-third street; pine block paving on Capitol avenue, from Twenty-first street to a point 633.4 feet north of Thirty-third street. Cement walks have been petitioned for Eleventh-st., from Capitol avenue to Senate avenue.

Brooklyn, N. Y.—(Special.)—The common council has declared its intention to grade and pave Hopkinson avenue, from Atlantic avenue to Bergen street and Rochester avenue, from St. Marks avenue to Eastern parkway with trap block pavement; to repave Thirteenth street, from Eighth avenue to Prospect park, with asphalt; to repave Jefferson street, from Brement to Central avenue, with granite block pavement.

New York, N. Y.—(Special.)—The Board of Aldermen of New York City recently passed the following paving items: Roadway at the intersection of Lexington avenue with One Hundred and First street to be paved with asphalt block pavement on concrete foundation; carriage way of Twenty-eighth street, First to Lexington avenue with asphalt on the present pavement; carriage way of E. Twenty-ninth street, from First to Third ave, with asphalt on the present pavement.

Milwaukee, Wis. — Preliminary steps were taken today for some large paving improvements in the sending out of notices calling upon property-owners to make sewer and water connections on the streets which are to be paved before Sept. 1. All of the pavements which are to be laid are permanent pavements and all save one are asphalt. The exception is a vitrified brick pavement, which is to be laid on Galena street, between Fourth and Seventh streets. The asphalt pavements which the notices are being sent out on are: Third street, from a point 320 feet south of State street to Chestnut street; E. Water street, from Mason street to Wisconsin street; Wells street, from Third street to the Milwaukee river; Fifth street, from Wells street to Cedar street; Sixth street, from Grand avenue to Clybourne street.

Chicago, Ill.—Petitions have been referred to the engineer of the street department for paving Hermitage avenue, between Irving Park boulevard and Berteau avenue. Commissioner L. E. McGann has received estimates of the cost of the proposed asphalt strips in Michagan avenue and Rush street, which are as follows: To depress granite blocks 3½ inches and put in a 2-inch binder

and a 1½-inch asphalt on top will cose $2.50 a lineal foot, or $2.25 a square yard; total, $9,225. To remove granite blocks and fill with concrete and asphalt $1.67 per lineal foot, or $1.50 a square yard; total, $6,150. To lay one-inch strip of asphalt over granite blocks $1.39 a lineal foot, or $1.25 a square yard; total, $5.125. The first named estimate meets with the approval of Commissioner McGann. Volney W. Foster, president of the Western Paving and Supply Co., has suggested a plan which would secure asphalt pavement in every street in the down town district. The plan is to have the work done by private contract when the consent of the interested property-owners is secured, and where this cannot be done the city will be asked to levy a special assessment. The first step in line with this plan was taken Aug. 24, when a petition was filed with Commissioner McGann asking for permission to pave with asphalt La Salle street, between Jackson and Adams street, by private contract, the money for the improvement to be paid by abutting property-owners in the block.

SEWERS.

Mobile, Ala.—Mayor G. C. Bush visited Birmingham, Aug. 18, for the purpose of examining the sewerage system.

London, O.—The council has been asked for permission by Henry Hayden to construct a sewer, 30x36 inches, to be paid for by property-owners abutting thereon.

Hoboken, N. J.—The mayor and councils are considering the drainage of the Hoboken meadows, which would be done by the establishment of a pumping plant and the completion of a satisfactory levee system.

Toledo, O.—Councilman Reeves favors the adoption of an ordinance which will prevent contractors from tunnelirg in the construction of brick sewers because of the practical impossibility of properly inspecting the sewer when tunneled.

Ashland, Pa.—Judge Savidge, Congressman Kulp, Edward Brennan, D. C. Kaseman and Lewis Dewart have organized a company, to be known as the Anthracite Sewer Co., for the construction and maintenance of sewers under surface of Shamokin and Coal township.

New Rochelle, N. Y.—The sewer commissioners have decided to not use the $65,000 recently voted for improvements in the sewer outlet for a pumping station and disposal works. The plan now contemplated is a sloping tunnel through Hudson Park and along Potter Shore to a point beyond Bailey's Rock.

New Orleans, La.—The New Orleans Sewer Co. will cease its efforts to compromise with the council, but will make a fight in the courts to establish the validity of the franchise purchased last March, according to press reports. The sewerage committee has decided to report in favor of municipal aid.

Boston, Mass.—A new set of sewage basins, covering five acres of ground and having a capacity of 25,000,000 gallons, will be built to replace the four basins at Moon Island, which were built in 1884. The basins will be built with 17½ feet retaining walls and concrete floors and will be emptied twice a day. Their capacity will be 100,000,000 gallons in twenty-four hours.

San Antonio, Tex.—City Engineer Wychetzki advocates a hydraulic test of the new sewerage system which is contemplated, the test to consist of sealing up the sewers at intervals and filling the pipes with water, the grade of the sewer supplying the necessary "head." This test is opposed, however, on the ground that sewers are not constructed to stand a strong pressure from within, and that the pressure of a column of water applied to the inside of the sewers would burst them.

Milwaukee, Wis.—In his annual report Dr. Walter Kempter, health commissioner, declares that the waters of Lake Michigan are becoming polluted by the tons of sewage which run into the lake daily through the river in this city, and that not only this city, but Racine and Chicago, will soon suffer. He believes that contamination of the water by the Milwaukee sewage will become very noticeable in Chicago as soon as the new drainage canal is put in operation, as a strong current will be created along the west shore of the lake flowing in a southerly direction.

CONTRACTS TO BE LET.

Trenton, N. J.—Bids are asked until Sept. 7 for constructing sewers in three streets. C. E. Murray, city clerk.

Wapakoneta, O.—Sealed proposals will be received until Sept. 3 for the construction of the Means ditch. Samuel Craig.

New York, N. Y.—Bids are asked until Sept. 2 for constructing sewers in several streets. Lewis F. Haffen, commissioner street improvements.

Omaha, Neb.—Bids will be asked soon for constructing about 3,000 ft. of 12-in. sanitary sewer in Missouri avenue.

Defiance, O.—Sealed bids will be received until Sept. 3 for constructing sewers in certain streets. G. J. Malley, city clerk.

Norwood, O.—Bids will be received until Sept. 4 for constructing sewers in main district No. 2. W. E. Wichgar, village clerk.

Cleveland, O.—Bids are asked until Sept. 16 for constructing a sewer in Chandler street. George R. Warden, director public works.

Cincinnati, O.—Bids are asked until Sept. 15 for constructing trunk sewer in Bloody Run. Aug. Herrman, president B. of A.

South Bend, Ind.—Sealed proposals will be received until Sept. 13 for constructing a lateral sewer in Sample street. L. A. Hull, city clerk.

Harrison, N. J.—Sealed proposals will be received until Sept. 7 for constructing a pipe sewer in Hamilton street. B. P. Walsh, town clerk.

Toledo, O.—Sealed proposals will be received until Sept. 15 for constructing a cylindrical brick sewer in Third street. Lem P. Harris, city clerk.

Cleveland, O.—Sealed proposals will be received until Sept. 9 for constructing sewers in Oliver street and Case avenue. George R. Warden, director public works.

Hammond, Ind.—Sealed proposals will be received until Sept. 7 for constructing 15-in. tile sewers in sundry streets, with necessary appurtenances. W. B. Bridge, C. E.

Evanston, O.—Sealed proposals will be received until Sept. 20 for the construction of house sewers in Wabash avenue, in districts Nos. 2 and 3 of general sewerage plan; certified check, $200. Wm. H. Krapp, clerk.

CONTRACTS AWARDED.

Evansville, Ind.—G. D. Howe & Son secured the contract for a main sewer in Fulton avenue.

Duquesne, Pa.—The contract for building a main sewer was awarded to William J. Leader of this city for $5,975.

Newport, Me.—The contract for building the new sewer has been awarded to Charles N. Taylor of Natick, Mass., for $1,994.

Webster, Mass.—The contract for laying the S. Main street sewer was awarded to Lucien Taylor, Worcester, Mass., Aug. 3, for $3,892.75.

New Britain, Conn.—The contract for building sewers in W. Race and Valley streets has been awarded to Fred T. Ley & Co. of Springfield.

Buffalo, N. Y.—Fred J. Martin, 557 Seventh street, was awarded the contract Aug. 5 for sewer work in Cambridge avenue for $1,644.

Boonville, Mo.—The contract for constructing 10,294 feet of pipe sewers was awarded July 27 to C. A. Ellis, Kansas City, Kas., for $5,637.

Corry, Pa.—Ulrick, Nissley & Williams, Springfield, O., secured the contract Aug. 9 for constructing three miles of pipe sewers for $10,890.

West Hartford, Conn.—The contract for constructing the sewer on the east side was awarded to Robert D. Maynard, Springfield, Mass., for $11,515.48.

Chelsea, Mass.—The contract for building sewers and connecting with the Metropolitan system has been awarded to G. L. Mirick of Malden for $5,358.10.

Peterboro, Ont.—The contract for constructing the sewerage system was awarded to Kennedy & Wade for $9,916. The town will furnish the pipe, cement and brick.

Camden, N. J.—The contract for constructing a sewer on Vanhorn street, from the West Jersey railroad to Eighth street, was awarded to Aaron Ward Aug. 16 at 73 cents a lineal foot.

Rochester, N. Y.—The contract for the extension of the West Side main sewer into the town of Gates, has been awarded to Whitmore, Rauber & Vicinus, of this city.

Des Moines, Ia.—Sewer contracts were awarded, Aug. 16, as follows: E. Fifteenth street, T. J. Casselberry; E. Ninth street, Hans Nelson; Chestnut street, H. A. King, E. Court avenue, O. P. Herrick.

Bridgeport, Conn.—The contract for the construction of the Hallet street and Central avenue sewers have been awarded to E. T. Doolittle, and for Lindley and Center streets, to the B. D. Pierce Manufacturing Co.

Cleveland, O.—The contract for furnishing material for the Glenville sewerage system has been awarded to the Kelley Island Lime and Transportation Co., of this city, for $4,000.

Spencer, Mass.—The contract for the construction of the new sewer force main and sewage disposal beds was awarded, Aug. 20, to Newell & Snowling, of Uxbridge, for $9,669.

Cleveland, O.—The contract for the second section of the Walworth Run intercepting sewer was awarded, Aug. 6, to M. F. Bramley and F. E. Gribben, for $202,980.

Richmond, Ind.—Sewer contracts have been awarded as follows: 524-foot 9-inch pipe sewer, John H. A. Schneider, $1.29 a lineal foot; 592-foot 12-inch pipe sewer, August Turner, 67½ cents a lineal foot.

Spokane, Wash.—Fife & Conlon secured the contract, Aug. 7, for the construction of the sewer on Fourth and Fifth avenues and Maple street for $5,300.

Allegheny, Pa.—The contract for constructing a main sewer along Jack's Run, from California avenue to the Ohio river, has been awarded to Thos. Prosser for $1,084.46, who also secured contracts for seven lateral sewers.

Carlinville, Ill.—The contract for constructing a 5-foot double ring brick main sewer was awarded, Aug. 3, to Henry Kuester, at $2.98 a lineal foot; manholes, $12; 12-inch inlets, 40 cents a foot; 18-inch inlets, $1.

Lynn, Mass.—The contract for extending a sewer in Eastern avenue, from Oakwood avenue to Glenwood street, has been awarded to A. E. Bryer, for $2,183. James Heath secured the contract for constructing a sewer in Chestnut and Broadway streets, from Strasburg brook to Mansfield street, for $5,807.50.

Middletown, O.—Bids were opened, Aug. 19, for constructing sewers in Bull's Run, Main and Crawford streets. J. Monger & Co. of Dayton presented the lowest bid on the Bull's Run sewer, $3,582.15, and the Crawford street sewer, $2,144.77, and Barry & Mehan, of this city, presented the lowest bid on the Main street sewer, $2,562.85.

Fort Wayne, Ind.—Bids were received, Aug. 19, for building the Lakeside sewer, as follows: Calhoun to Clinton street, Der-Heimer & Shanklin, $3.44 per lineal foot; Singleton & Sheehan, $2.90; C. E. Moellering & Co., $3.10; Poster & Wilhelm, $3.48; J. Remus and H. Canning, $3.03; H. W. Tapp, $3.55; German Kentucky Asphalt company, $3.85; T. B. Empie, $2.30. The bids were taken under consideration.

Pittsburg, Pa.—Sewer contracts were awarded, Aug. 2, as follows: Sloan, McIlvain & Ott Bros., two on Beechwood avenue, one on Friendship and Irving avenues, Jordan alley and Lebanon and Mission streets; John H. McQuade, Alder street, two on Beechwood avenue, one on Fifth avenue and Vista street; Thomas H. Rose, Dixon and Sciota streets; J. A. Ransom, Locust street; J. B. Sheets, Millvale avenue; Keeling & Ridge, St. Andrews street; Cronin & O'Hara, Wylie avenue.

Baltimore, Md.—Contracts for the brick and cement for the Clifton avenue sewer were awarded, Aug. 16, as follows: For 20,000 hand-made brick, to Smith & Schwartz, at $6.90 per 1,000; for 20,000 machine-made bricks, to James Busey & Sons, at $6.10 and $6.70 per 1,000, according to quality; for 17,000 vitrified brick, to J. N. Dubarry, at $18.25 per 1,000. For cenment—J. N. DuBarry, at 47 cents per bag, or $1.14 per barrel; the National Building Supply company, at 51½ cents per bag, or $2.35 per barrel; to B. Wallis & Co., at $2.25, $2.24 and $2.60 per barrel, some being slow settling and some fast settling.

Wallingford, Conn.—Bids were received, Aug. 18, for building the Elm street sewer. The work will include 1,175 feet of 24-inch pipe; five manholes, four catch basins, earth filling, masonry, etc. The bids, which numbered ten, were as follows: E. McManus, Waterbury, $7,487; Curtiss & Carpenter, Waterbury, $7,176.25; McCormack Steam

Heating company, $7,102; L. O'Brien, New Haven, $6,695.50; F. T. Joy & Co., Springfield, Mass., $6,671.50; F. A. Caldwell, New Britain, $6,260.25; T. F. Maher, New Haven, $6,005.01; J. Redmond & Co., $5,944.75; J. A. Doolittle & Co., New Haven, $5,879.25; Strauss Bros., $5,510.50. The awarding of the contract was postponed two weeks.

CONTEMPLATED WORK.

Kewanee, Ill.—A sewerage system is contemplated.

Milton, Pa.—The construction of a sewerage system is contemplated.

Ithaca, Mich.—The construction of a sewerage system is contemplated.

Aitken, Minn.—The question of sewerage construction is being agitated.

Lakewood, N. Y.—The question of sewerage is being agitated by the citizens.

Macon, Mo.—The construction of an adequate sewerage system is contemplated.

Westfield, N. Y.—The question of constructing a sewerage system is under discussion.

Owosso, Mich.—About 3,000 feet of the sewerage system will be constructed this fall.

Lockland, O.—The question of constructing a sewerage system is under discussion.

Webster City, Ia.—The construction of a sewerage system is contemplated by the council.

Mobile, Ala.—The city voted in favor of municipal ownership of water works and sewers Aug. 2.

Altoona, Pa.—Ordinances have been passed authorizing the construction of sewers in numerous streets.

Palo Alto, Cal.—Plans and estimates for a sewerage system have been submitted by the city engineer.

Macomb, Ill.—Ordinances have been passed providing for the construction of about 6,551 feet of sewers.

Chico, Cal.—The question of constructing a sewerage system is being discussed by the board of trustees.

Cleveland, O.—Sewers are contemplated for Pleasant, China, Valley, Finney and Miles Park streets and Woodland Hills avenue.

Pittsburg, Pa.—Ordinances were passed Aug. 12 for the construction of sewers on Howley, Butler, Rose and Shakespeare streets.

Amsterdam, N. Y.—The construction of several catch-basins and sewer extensions in several streets is contemplated.

Emeryville, Cal.—Bonds will be issued for the construction of a complete sewerage system, according to press reports.

Winooski, Vt.—A special meeting was held Aug. 17 to act upon the report of the sewer committee for the proposed sewerage system.

St. Albans, Vt.—The sewer commissioner recommends the construction of storm sewers at an estimated cost of $11,392.

Iron Mountain, Mich.—A lateral sewer will be built in B street, from Madison street to Stephenson avenue. James D. Cudlip, city clerk.

Huntington, W. Va.—(Special.)—John H. Sanborn, city engineer, says 5,000 lineal feet of 12-inch pipe sewers will be built at once.

Windsor Locks, Conn.—Plans for a sewerage system for this place have about been completed by E. W. Shedd, Providence, R. I.

Georgetown, Del.—The town council has decided to engage a competent engineer to ascertain the cost of a complete sewerage system.

Baltimore, Md.—The final report of the sewage commission will not be issued until about the middle or latter part of September.

Franklin, N. H.—J. W. Dresser of the board of health has recommended that 600 feet of sewers be laid on Elm avenue and Pine street.

South Orange, N. J.—The ordinance providing for the construction of an outlet sewer to tidewater was passed on its first reading Aug. 23.

St. Paul, Minn.—The board of public works postponed action Aug. 12 on the proposed sewer for Conway street, from Forest to Cypress, for one month.

Maquoketa, Ia.—(Special.)—Plans have been prepared for a complete sewerage system by the Iowa Engineering Co., Clinton, Ia., and bids will soon be asked.

Shelby, O.—The sewer commission, in a report submitted to the mayor and council Aug. 19, favor a sewerage system similar to the system at Oberlin, O.

Taunton, Mass.—The mayor and board of aldermen have adopted the order appropriating $83,500 for the construction of the sewage filtration bed, laying pipes, etc.

Fairburg, Ill.—The city council recently instructed the street and alley committee to engage an expert engineer to make a survey of the routes for the proposed new sewer.

Coxsackie, N. Y.—The plans for the proposed sewerage system will be completed about Sept. 1. Correspondence is solicited with manufacturers of sewer materials and supplies.

Stratford, Ont.—The report of the sewer committee, recommending a sewage disposal system, has been adopted by the common council and the city engineer has been instructed to prepare plans.

South Portland, Me.—A special town meeting was held recently to vote on the question of appropriating sufficient money to build sewers. The sum of $30,000 has been asked to build sewers in Ferry village.

Springfield, Mass.—The sewer department has begun to outline its work for next year. It reports the need of relief sewers and a trunk sewer for Jefferson avenue, and for the section east of the New England railroad.

Mattoon, Ill.—(Special.)—A. C. Loomis, city engineer, says the street and drainage committee have ordered the survey and the plans drawn up for an intercepting belt sewer for this place. The work will be begun at once.

Newport News, Va.—A sewage commission, consisting of three members of the city council, Mayor Post and George V. Alsop, city engineer, will be appointed. An appropriation of $1,000 has been provided to defray the expenses of the preliminary work.

Pawtucket, R. I.—Resolutions were passed Aug. 11 appropriating $2,000 for the construction of a sewer in Broadway, and $2,000 for lowering the sewer in Pawtucket avenue. Petitions for sewers in Church, Lafayette, Carnation, Sabine, Woodbine and Mary streets and Pleasant avenue were referred.

WATER-WORKS.

Lancaster, O.—The construction of a reservoir is contemplated.

Erie, Pa.—A new pump will probably be purchased.

Corning, N. Y.—The estimated cost of a new site and reservoir is $5,000.

Hyattsville, Md.—The estimated cost of a water works system is $20,000.

Lancaster, Pa.—The construction of a filtration system is contemplated.

Kingsfield, Me.—Surveys have been made for the proposed water works system.

Westfield, Mass.—Bids will probably be asked soon for the new water supply.

Roxboro, N. C.—Plans and specifications are being prepared for a water works system.

Monticello, Fla.—Plans and specifications are being prepared for a water works system.

Senatobia, Miss.—Bids will be asked soon for the construction of a new water works system.

Henderson, Ky.—About 2,000 feet of water mains will be laid. S. H. Kimmel, city engineer.

Lake Bluff, Ill.—The village board is taking action toward securing better water works.

Holyoke, Mass.—The construction of a filter plant is contemplated by the water commissioners.

Holly Springs, Miss.—(Special.)—Mayor Sam Finley says bids will be asked soon for water works bonds.

Hazlehurst, Miss.—This town will soon vote on the question of issuing bonds for constructing water works.

Camden, S. C.—Mayor Zemp may be addressed regarding the agitation for municipal water works in this city.

Suffield, Conn.—The water company proposes the extension of the water works system about three miles.

Grafton, W. Va.—Plans are being prepared for the extension of the water works system to the West Side.

Holden, Mass.—Plans have been accepted for the proposed water works system, according to press reports.

Seymour, Ind.—The construction of a filtering plant is said to be contemplated by the Seymour Water Co.

Ionia, Mich.—The proposition to bond this city for $6,500 for improving the water works plant was defeated Aug. 16.

Colton, Cal.—This city is considering the advisability of issuing $20,000 in bonds to perfect and maintain the water system.

Santa Clara, Cal.—This town is contemplating the construction of a pumping reservoir for use in connection with the artesian wells.

Boyertown, Pa.—The construction of municipal water works is contemplated. Howard Hartman, Charles R. Bond and John Schaeffer.

Cranston, R. I.—The construction of municipal water works is contemplated, according to press reports. Daniel D. Waterman, town clerk.

Toms River, N. J.—The Toms River Water Co. desires to receive proposals from engineers and supply companies. J. Howard, Williams, president.

Kenwood Park, Ia.—John Bower, William Black and S. O. Manville have been appointed a committee to investigate the feasibility of building water works.

The question of water works will be voted on as follows: Waterloo, Ill.; Sleepy Eye, Minn.; Goshen, N. Y.; Rock Valley, Ia.; Monroeville, O.; Caldwell, O.

Rock Island, Ill.—The mayor and water works committee were authorized Aug. 4 to employ an engineer to make plans and specifications for a reservoir.

Statesville, N. C.—Prof. Ludlow's report of survey, plans and specifications for a water works system for this town have been adopted by the aldermen.

Trenton, N. J.—Engineer Hague has made a report to the water board on filtration. The estimated cost of a filter plant is $286,000, or mechanical filter, $226,000.

Carthage, Mo.—Plans and specifications have been completed for the settling basin, which is to be erected by the Carthage Water Works Co., and bids will be asked soon.

Alton, Ill.—The New England Water Works Co. is considering the advisability, according to press reports, of putting in a filter and making other improvements.

Wheeling, W. Va.—Henry Jones, president of the water board, regards a new reservoir a necessity, and favors one of 100,000,000 or 150,000,000 gallons capacity; estimated cost, $180,000.

New Britain, Conn.—The cost of the two proposed 20-in. pipe lines from Roaring Brook to Shuttle Meadow instead of one 30-in. pipe as was originally intended, will be about $125,000.

Portage, Wis.—The common council Aug. 2 ordered the withholding of hydrant rental now due until such time as a favorable report may be rendered from a special committee appointed by the mayor to investigate the water supply of the Portage Water Co.

Chattanooga, Tenn.—Mayor Ochs appointed a committee, consisting of Aldermen Howell, Dillard, Martin, Brown and Glover, to consider the question of engaging an engineer to ascertain the cost of a municipal water plant. The special committee does not think it is best to get a report on a new plant just now and has recommended to the council another regulation of rates and thus settle the matter temporarily.

The construction of water works is contemplated at the following places: Georgetown, Del.; Walhalla, S. C.; Lawrenceburg, Tenn.; Rockwood, Tenn.; Corbin, Ky.; Scottsburg, Ind.; North Liberty, Ind.; Stauffville, Ont.; Sycamore, O.; Rennville, Ind.; Danforth, Me.; West Chonshohocken, Pa.; Reno, Neb.; Vailsburg, N. J.; Sullivan, Me.; Savannah, N. Y.; Wayland, N. Y.; Windsor, N. Y.; Confluence, Pa.; Wayland, Mich.; Henderson, Minn.

CONTRACTS TO BE LET.

Para, Brazil—Bids will be received until Nov. 18 for the purchase of the water works.

Marathon, N. Y.—Bids are asked until Sept. 2 for the construction of a water works system. J. W. Graves, village clerk.

Jacksonville, Fla.—Sealed bids will be received until Sept. 7 for erecting a steel water tower. B. F. Dillon, chairman board water works trustees.

Millerstown, Pa.—Sealed proposals will be

received until Sept. 11 for a reservoir, hydrants, valves and specials. Wm. Kipp, secretary.

Elizabeth City, N. C.—Bids will be received until Sept. 6 for the purchase of a franchise for water works for this place. C. C. Pool, mayor.

Chicago, Ill.—Sealed proposals will be received until Sept. 5 for furnishing a 14,000,000 gallon pumping engine at the Eighty-sixth street pumping station. L. E. McGann, commissioner public works.

Baltimore, Md.—Sealed proposals will be received until Sept. 4 for the erection and completion of the superstructure of the Mount Royal pumping station. T. J. Hayward, chairman engineers' committee.

CONTRACTS AWARDED.

Kaukauna, Wis.—The franchise for a water works system has been granted to Reese & Breier. The system will cost $75,000.

Hamilton, O.—R. N. Andrews has been awarded the contract for putting in the water pipes at West Alexandria for $12,000.

Greensburg, Pa.—The contract for constructing the reservoir at Wolf Springs has been awarded to Owen Murphy, of Mt. Pleasant, Pa.

Munising, Mich.—The contract for the construction of the water works plant has been awarded to the Saw-Kendall Engineering Co., Toledo, O.

Oxford, N. Y.—The contract for constructing the water works plant was awarded, Aug. 13, to M. B. Birdseye & Son, of Fayetteville, N. Y., for $20,634.35.

Helena, Mont.—The Helena Consolidated Water Co. has accepted the offer of the city for a five-year contract, at $18,000 a year, to be dated from Aug. 1, 1897.

Boston, Mass.—The contract for laying water pipe in Section 19 was awarded Aug. 2 to E. W. Everson & Co., for $34,269, and in Section 23, Bruno & Skidmore, for $8,453.50.

Stanley, Wis.—Stevens & Vincent, Chippewa Falls, Wis., secured the contract Aug. 19 for laying about 2,800 feet of 16 and 4-inch cast iron pipe, with special castings, etc., for $1,785.

Owego, N. Y.—(Special.)—L. J. Richardson, Owego, N. Y., has been awarded the contract for laying a 12-inch pipe line for the Midland Water Co., from Metuchen to Woodbridge, and from there to Carteret, N. J., a distance of eight miles.

Rhinelander, Wis.—The contract was awarded Aug. 21 to J. E. Jackson of the Sanitary Construction Co., Green Bay, Wis., for laying 2,100 feet of 6-inch water main at 54 cents a foot.

Ft. Myer, Va.—The contract for the extension of the water supply system for Ft. Myer and Arlington Cemetery, Va., has been awarded to the Washington Construction Co., Washington, D. C., for $4,875.

Canton, Ill.—(Special.)—Geo. W. Chandler, city engineer, says the contract for constructing complete the Astoria, Ill., water works plant was awarded to the Phoenix Construction Co. of Chicago, they being the lowest bidders, for the sum of $12,117.

Buffalo, N. Y.—The Lake Erie Engineering Works of this city presented the lowest bid, Aug. 18, for constructing a high-class pumping engine at $64,250. The other bids were: Lake Erie Engineering Works, $64,250; Groshon High Duty Pumping Engine Co. of New York, $92,000; Holly Manufacturing Co. of Lockport, steam $82,500, and for a horizontal triplex power pump, $47,500; Henry R. Worthington, under specification A, $77,800, and under specification B, $99,500.

Harrisburg, Pa.—(Special.)—The board of water commissioners received the following bids for laying new influent pipes in the Susquehanna river, viz.: James Nalen, $7,945; Lynch & McNiff, $8,000; Ward & Stucker, $4,300; Henry Opperman, $3,242; Henry Schlayer, $2,697. The contract was awarded to the lowest bidder. Work will be commenced immediately under the supervision of City Engineer Cowden, and the job will be finished in about a month. This work will be done in depth of water varying from three to six feet, at low water stage in river. The pipes will be extended out in the stream several hundred feet further than heretofore, in order to avoid the sewage emptying into the river above the pumping station and also to secure water from a point in the river beyond the coal culm line. The slightest rise in the river carries with it vast quantities of culm, washed down from the coal regions up the Susquehanna, which pollutes the stream about one-third of its width, extending cutward from the Harrisburg side all along from the mines to the bay. This culm water is decidedly black in color, and, while physicians have declared it not unhealthy, it has proved a source of great annoyance to the citizens and it is to be hoped the proposed extension of the influent pipes will remedy the evil.

BRIDGES.

North Smithfield, R. I.—A new steel bridge will probably be built.

Quincy, Ill.—The construction of a wagon bridge is being urged.

Minot, N. D.—The county will build a bridge across the Mouse river.

Delhi, N. Y.—The construction of a new iron bridge at Bridge-st. is contemplated.

Waterville, Minn.—A steel bridge will be built to replace the trestle bridge near this town.

St. Louis, Mo.—Bids are asked until Sept. 7 for the construction of a concrete bridge in Forest park.

Colfax, Wash.—Bids are asked until Sept. 7 for building three forty-foot bridges. John Tobin, county auditor.

Saginaw, Mich.—A new bridge will be built at Court street, and the Genesee avenue bridge will be rebuilt.

Dwight, Ill.—A petition has been circulated for an iron bridge on Mazon avenue, across the Gooseberry.

Clinton, Ind.—The citizens are taking active steps toward securing a new bridge over the Wabash.

Madison, Ky.—The construction of a 270-foot iron truss bridge is contemplated. J. C. Bacon, chairman committee.

Middletown, O.—The contract for the bridge over the Miami river has been awarded to Joseph Guillaume for $9,760.

Idaho City, Idaho—Bids are wanted until Sept. 13 for constructing a bridge over Schafer creek. W. F. Connaughton, clerk.

Duluth, Minn.—Plans and estimates will be prepared for two bridges at the West End by the city engineer.

Fresno, Cal.—Sealed bids will be received until Sept. 14 for the construction of a highway bridge. T. G. Hart, clerk board supervisors.

Austin, Minn.—The county commissioners have voted to construct two bridges over Otter creek, one 50 ft. and one 60 ft. long.

St. Joseph, Mo.—Bids are asked until Sept. 3 for constructing a bridge on the Clinton county line. Theo. Steinacker, county commissioner.

Ottumwa, Ia.—The contract will probably be let in September for two new briflges across the Des Moines river at Vine and Blackhawk streets.

Hillsboro, N. D.—The Wrought Iron Bridge Co., Canton, O., was awarded the contract for building eight county bridges for $7,325.

Passaic, N. J.—The bridge across the Passaic river, between this city and Garfield, will probably be rebuilt by Bergen and Passaic counties.

Sioux City, Ia.—The construction of a new steel bridge, to replace the present structure at W. Sixth street, is contemplated.

Alma, Neb.—Bids will be received until Sept. 7 for building an iron bridge across the Republican river. S. L. Roberts, county clerk.

Merrill, Wis.—The construction of an 80-foot steel bridge, with three driveways, is contemplated. G. R. Sturtevant, city engineer.

Yankton, S. D.—Bids will be received until Sept. 6 for constructing a bridge across the James river and for repairing the Morgan bridge.

Kankakee, Ill.—The city engineer has been instructed to draw plans and specifications for the erection of a new bridge across Soldier's creek.

Monticello, Miss.—The contract will be let, Sept. 6, for building a bridge across White Sand creek, and one across Cooper's creek. W. H. Speights, chancery clerk.

Columbus, O.—The commissioners will rebuild the bridge across the Big Walnut, at Central College, which was destroyed by fire recently.

Louisville, Ky.—The contract for a bridge over Beargrass creek, at Kentucky street, was awarded Aug. 11 to Keepers & Thacher, Detroit, Mich., for $17,000.

Bridgeport, Conn.—The selectmen are taking estimates for several styles of bridges to replace the one at Fleetwood avenue. Either an iron or brick arch is favored.

Hartford, Ky.—The Wrought Iron Bridge Co., Canton, O., secured the contract for building an iron truss suspension bridge, 175 feet long, across Rough rover, for $6,675.

Milwaukee, Wis.—The county board on bridges and highways decided, Aug. 19, to reject all bids for building a bridge across Root creek, and advertise for a third time for proposals.

New York, N. Y.—Bids are asked until Sept. 16 for constructing a bridge over Harlem river, between One-hundred and Twenty-fifth street and First avenue, and One-hundred and Thirty-fourth street and Willis avenue. Chas. H. T. Collis, commissioner public works.

Canton, Ill.—(Special.)—G. W. Chandler, city engineer, says the contract for a 40-foot span steel highway bridge over west branch of Copperas creek (near Canton) on stone abutments, was awarded, Aug. 7, to J. M. Savill & Son, of this city, for $780.

Helena, Mont.—The county commissioners have ordered bridges built over Ten Mile creek at Central Park; over Dubray creek in the northern part of the county; over Little Prickly Pear at Gleason's crossing; over Prickly Pear at East Helena.

Bridgeport, Conn.—The Wrought Iron Bridge Co., Canton, O., was awarded the contract, Aug. 18, for constructing an iron bridge over Rooster river at Stratfield avenue, in Fairfield. The harbor committee has been instructed to obtain plans for a new bridge across Yellow Mill pond at Stratford avenue.

PARKS.

New York, N. Y.—Bids are asked until Sept. 7, by the department of parks, for labor and materials for improving St. John's park.

Troy, N. Y.—The park commission contemplates commencing early next spring the work of preparing the water works property for use as a public park.

Canton, Ia.—Plans for the improvement of Cook park have been submitted by Assistant Clerk Bender and adopted by the board of park commissioners.

Lexington, Ky.—Charles Scott, manager of the Chautauqua Assembly, tendered Woodland to this city for use as a public park recently, provided the city would furnish adequate police protection.

Newark, N. J.—A resolution was passed by the East Orange Township committee, Aug. 9, concurring in the proposed action of the Essex county park commission to take Oliver and Thompson streets, from Main street to Park avenue, for park purposes.

Rochester, N. Y.—Mr Olmsted of the firm of Olmsted, Olmsted & Elliott, Brookline, Mass., has been engaged to design the proposed improvements for Lake View park. This firm furnished the original designs for Rochester's park system.

Chicago, Ill.—The Lincoln park commissioners were instructed, Aug. 4, to offer prices to landscape gardners for plans for the proposed new park for the North Side. The park will be situated at the foot of Chicago-ave. and will cover fifteen acres of land.

STREET CLEANING AND SPRINKLING.

Shamokin, Pa.—The construction of a garbage crematory is contemplated. F. A. Smink, Clk.

Syracuse, N. Y.—The contract for garbage disposal, for ten years, has been awarded to John Dunfee for $26,000 a year.

Stockton, Cal.—The construction of a garbage plant is contemplated, according to press reports.

Redlands, Cal.—The purchase of a street sweeper is contemplated, according to press reports. Mr. Beal is interested.

Hamilton, Canada—City Engineer Barrow has decided to recommend to councils the purchase of an incinerator to burn the rubbish, etc. If purchased it will be placed in the sewage disposal works at the foot of Ferguson avenue.

Minneapolis, Minn.—Sealed proposals will be received until Sept. 10 for the collection and disposition of garbage, dead animals,

ashes, etc. Bids may be made separately or collectively. L. A. Lydiard, city clerk.

Paterson, N. J.—The Passaic Sanitary Co. has been organized and will make an effort to secure a five-year contract for disposing of the garbage in this city, and if successful in getting the contract will build a garbage crematory at an estimated cost of $15,000.

Newark, N. J.—A company is being formed in this city to convert sewage, night soil and offal of all kinds, including street sweepings, into ammonia and other chemical compounds by a new process that has just been patented by G. G. Pridham of this city.

San Francisco, Cal.—After an experiment with salt water for street sprinkling it has been found that the streets do not require sprinkling as often as when fresh water is used; that the salt dirt dries in a hard cake that does not readily become pulverized into dust.

Chicago, Ill.—Sealed proposals will be received until Sept. 3 for furnishing all wagons, carts, teams, machinery, tools, implements and remove all garbage, ashes and rubbish from the streets, alleys and public places for a period of five years, commencing Jan. 1, 1898. Cash or certified check, $10,000. L. E. McGann, Comr. Pub. Wks.

Fort Meyer, Va.—Bids were received Aug. 16 for constructing a crematory, as follows: Jas. O'Day, Washington, D. C., $2,329; W. M. Crilly, Chicago, Ill., $2,180; R. W. Darby, Washington, D. C., $2,261; Washington Construction Co., Washington, D. C., $4,688; Wm. F. Walling, Washington, D. C., $1,691.

Chicago, Ill.—Assistant Health Commissioner Reilly proposes the construction of a large steel box inside the chimney of each of the city's pumping and electric light power stations, so that the garbage now taken to the dumps may be placed therein and dried by the waste heat and fitted for use as fuel under the boilers.

Cleveland, O.—Bids were received July 30 for the yearly collection, removal and destruction of the garbage and night soil of this city, for five and ten-year periods respectively, as follows: S. N. Watterson, $115,000 and $120,000; Newburg Fertilizer Co., $104,940 and $106,940; Buckeye Refuse Co., $106,000 and $112,000; A. A. Dittrick, $135,000 and $123,000; M. F. Bramley, $126,000 and $114,000.

Milwaukee, Wis.—A special committee of the council has decided to recommend for passage an ordinance providing for the issue of $140,000 bonds for a garbage disposal plant, to be owned and operated by the city. City Engineer Benzenberg is in favor of drawing up specifications which would require several systems to be combined, thereby inviting competition.

Cincinnati, O.—After an experiment of a month of leaving a dry strip down the middle of asphalt streets and on each side of granite and brick streets, for the purpose of adopting whichever worked to the best advantage, the board of administration has changed the regulations so as to provide for a dry strip from four to six feet wide down the middle of every street sprinkled.

TOO LATE FOR CLASSIFICATION.

Flint, Mich.—A sewer will be constructed in Saginaw street.

Lake Bluff, Ill.—The construction of a sewerage system is contemplated.

Macon, Ga.—The necessary machinery for the new pumping station will be ordered at once.

Collingwood, Ont.—This town contemplates the construction of a sewerage system.

Webster City, Ia.—The construction of a sewerage system, at a cost of $25,000, is contemplated.

Shawville, Que.—The purchase of a road machine is contemplated, according to press reports.

Oakland, Cal.—The construction of a bridge over the harbor, at Webster street, is contemplated.

Lyons, Ia.—The contract for constructing sewers has been awarded to W. H. Gade & Co. of this city.

St. Joseph, Mich.—The construction of about one mile of pipe sewers is contemplated this fall. B. P. W.

Houston, Tex.—Bids are asked until Sept. 6 for paving in the Fifth ward. L. A. Gueringer, Cy. Engr.

McHenry, Ill.—The contract for constructing water works has been awarded to H. A. Keith & Co. for $21,662.

Moscow, Idaho—Bids are asked until Sept. 14 for constructing a bridge across the Palousa river, near Princeton.

Madisonville, O.—Bids will be received until Sept. 4 for macadamizing Central and Bramble avenues. Bennett Carter, Vil. Clk.

Sleepy Eye, Minn.—An engineer will be engaged to draw plans and specifications for the proposed water works system.

Madera, Cal.—Bids will be received until Sept. 7 for constructing a bridge across the Fresno river. C. J. Eubanks, Clk.

Pittsburg, Pa.—The bid of Booth & Flinn was accepted for improving the first three miles of the Verona road. Their bid was $29,438.

Raleigh, N. C.—The question of issuing $50,000 5 per cent. bonds for improving the streets will be voted on Sept. 10. W. M. Russ, mayor.

St. Joseph, Mo.—Bids will be received until Sept. 6 for grading the Garrettsburg road and two hills south of Taos. Theo. Steinacker, Co. Surv.

Summerville, Ga.—Sealed proposals will be received until Sept. 14 for constructing a sewerage and water works system. E. F. Verdery, intendant.

Marion, Ind.—Sealed bids will be received until Sept. 9 for improving White avenue and Twentieth and First streets. John Watts, city clerk.

Chicago, Ill.—Sealed proposals will be received until Sept. 23 for constructing one concrete arch culvert. W. L. Marshall, Major Engrs.

Grand Rapids, Mich.—The contract for improving Bates street, from East to Fuller, with gravel has been awarded to Sullivan & Higgins for $7,383.

Minneapolis, Minn.—About 62,800 feet of sewers will be constructed in 1898 at a cost of $330,297, according to City Engineer Cappelen's estimates.

Indianapolis, Ind.—An appropriation of $12,000 has been made by the council to be used for bridge construction. B. J. T. Jeup, Cy. Engr.

Troy, N. Y.—The contract for paving Ninth street, from Middleburgh to Hoosick

streets with brick has been awarded to Wm. Fitzsimmons, for $16,398.

Springfield, O.—The advertisement of bids for a 25 foot bridge over the arch at the foot of Mitchell hill has been authorized. Clk. bd. pub. affairs.

Parkersburg, W. Va.—Bids are asked until Sept. 14 for the purchase of $30,000 5 per cent. bonds for the construction of a sewerage system and city hospital.

London, Ont.—The contract for constructing sections "G" and "H" of the new sewerage system has been awarded to H. Beharielf of Toronto for $8,253.

Somerville, N J.—Bids are asked until Sept. 13 for constructing about four miles of 8 to 20 inch pipe sewers. Jas. J. Bergen, prest. comrs.

Summerside, P. E. I.—A proposition has been made to this town by the Three Rivers Iron Works company to construct a sewerage and water works system.

Stapleton (S. I.), N. Y.—Sealed proposals will be received until Sept. 8 for constructing two highway bridges. Franklin C. Vitt, clk. bd. supv.

Paterson, N. J.—Bids are asked until Sept. 10 for macadamizing Twentieth street, from Vreeland avenue to the Boulevard. Ed N. Kevitt, Chm. Bd. freeholders.

Boston, Mass.—The contract for constructing a brick sewer, drains, connections, etc., in Peterboro street was awarded, Aug. 19, to Cullen Bros. for $13,222.

New York, N. Y.—Sealed proposals will be received until Sept. 9 for furnishing rubble and paving stone on dikes in Hudson river. Wm. Ludlow, Lieut.-Col., Engrs.

Dayton, O.—Sealed proposals will be received until Sept. 7 for paving with stone flagging, cement or asphalt, the sidewalks on Grand avenue. J. E. Gimperling, Cy. Comp.

Kansas City, Mo.—Sealed proposals will be received until Sept. 10 for grading and necessary culverts on the Swope Park boulevard. Thos. F. Callen, Co. Surv.

Willimantic, Conn.—Sealed proposals will be received until Sept. 6 for repairing the power pumps and foundations for same at the pumping station. Jas. Haggerty, Chm. Water Com.

Chicago, Ill.—Press reports are to the effect that the contract held by John P. Agnew for the erection of two pumping stations will be forfeited and new bids will be asked.

Hailey, Idaho—Bids are asked until Sept. 13 for the extension of the bridge between Cold Springs and Ketcham, and for a bridge at Glenn bridge crossing. W. C. Martin, Clk.

Passaic, N. J.—An ordinance has been passed for the construction of 8-in. pipe sewers, with flush tanks, manholes, etc., in Quincy and Jefferson streets. R. B. Tindall, Cy. Clk.

Cleveland, O.—The contract for constructing a sewer in Detroit street has been awarded to Wm. Lehman for $4,753; in Detroit street and Gordon avenue to Bernard McCarthy for $23,814.

Provo City, Utah—Bids are invited until Sept. 6 for constructing a bridge, with stone abutments, across the Provo river near the mouth of Provo canyon. Geo. Havercamp, Co. Clk.

New Albany, Ind.—Sealed proposals will be received until Sept. 20 for paving with brick, the alley between Pearl and State streets, from Spring to Elm. Samuel T. Mann, Cy. Engr.

Albany, N. Y.—Supt. Bailey has been instructed to secure plans and specifications for an addition to the Bleecker reservoir to be built for the reception of the filtered water.

Buffalo, N. Y.—Plans and specifications have been ordered prepared for constructing 18 to 20-in. pipe sewers and 45-in. brick sewers in various streets. E. B. Guthrie, Cy. Engr.

Michigan City, Ind.—Sealed proposals will be received until Sept. 13 for paving with crushed stone and stone curbing Washington street, from Ripley to Homer street,. Albert Leist, Cy Clk.

Roanoke, Va.—Sealed bids will be received until Sept. 20 for laying 1,050 lineal feet of 24-in. and 200 feet of 15-in. terra cotta pipe sewer on Franklin road. W. E. Thomas, Clk. City Council.

Atchison, Kas.—Bids were received Aug. 17 for repaving Kansas street, from Fourth to Tenth, with brick. The bids ranged from $12,226 by the Atchison Paving Brick Co., to $13,518 by J. G. Thayer.

Omaha, Neb.—Sealed proposals will be received until Sept. 3 for paving Twenty-fifth street, from Indiana to Cuming, with sheet asphaltum, brick or stone, and curbing. Andrew Rosewater, Chm. B. P. W.

Evansville, Ind.—Sealed proposals will be received until Sept. 11 for paving several alleys with brick and for grading Third avenue, from Oregon street to Highland place. Geo. W. Swearingen, Clk. B. P. W.

Richmond, Mo.—Bids will be received for constructing bridges, as follows: Sept. 2, near residence of Wm. Graham; Sept. 3, near residence of Thos. Turner; Sept. 4, near Lexington Junction. S. E. Bay, Co. Surv.

Marion, O.—Sealed proposals will be received until Sept. 17 for macadamizing Mt. Vernon avenue, from Church street to Grand avenue, the work to include curbing, catch basins, tile, etc. Jas. I. Beatty, city clerk.

Marshall, Mo.—Sealed proposals will be received until Sept. 8 for the construction of a public sewer; also for the construction of district sewers, with manholes, flush tanks and appurtenances. A. R. James, city clerk.

Los Angeles, Cal.—The water question will probably be settled by arbitration. The city's attorneys are of the opinion that to arbitrate the values of the property will not jeopardize the legal rights of the city.

Millerstown, Pa.—Sealed proposals will be received until Sept. 11 for building a 200,000-gallon reservoir, lined with clay, cement mortar and stone paving; 8, 6, 4, 3-inch cast iron pipes, specials, valves, etc. Wm. Kipp, Sec'y. Boro. Council.

Renfrew, Ont.—The contract for constructing the new sewerage and water works system has been awarded to the Three Rivers Iron Works Co., of Montreal, Que., for $51,874. Contracts have not yet been awarded for the pump house and pumping machinery.

Binghampton, N. Y.—Sealed proposals will be received until Sept. 14 for laying 2,400 feet of 36-inch ball joint cast iron pipe, building crib at intake, connecting pipe at wells at pumping station, building gate wells, etc. John Anderson, Sec'y. Bd. Water Com'rs.

Meriden, Conn.—Sealed proposals will be

received until Sept. 4 for the improvement of the wasteway at Kenmere, in the town of Berlin, consisting of rubble masonry, cement paving, concrete, etc. G. W. Miller, Supt. W. W.

Kansas City, Mo.—A resolution has been adopted for paving Troost avenue, from Nineteenth to Twentieth street, with a combination of asphalt and brick, the surface on each side of the car tracks to be paved with five feet of brick and the remainder with asphalt.

Quincy, Ill.—The F. W. Menke Stone Co. was awarded the contract Aug. 21 for paving with novaculite Eighteenth street, from Jersey to State street, at 72 cents for paving, 32 cents for guttering and 36 cents for curbing. Bids were received the same day for paving York street with novaculite, but were rejected and new bids will be received.

Omaha, Neb.—The Grant Paving Co. was the lowest bidder, Aug. 20, for repaving W. Farnam street with asphaltum, at $1.44 9-10 a square yard, class C, under a five-year guarantee. The lowest bid on brick, presented by the Omaha Brick and Construction Co., at $1.07, and on stone by Hugh Murphy, $1.49 a square yard. The contract will probably be awarded to the Grant Paving Co.

Bloomington, Ind.—Contracts for constructing sections of highway in Monroe county have been awarded as follows: Harrodsburg and Smithville road, Campbell & Donaldson, $20,172; Stinesville and Bloomington road, Blevins & Steele, $3,690; Ellettsville and Worthington road, Kerr & Dixon, $4,237; Tabor Hill and Owen County road, Blevins & Steele, $5,200; Griffy Creek and Gosport road, Hensley & Farr, $7,800; Ellettsville and Mt. Tabor road, Jas. Gilpin, $7,068.

Lake Forest, Ill.—Sealed proposals will be received until Sept. 6 for improving Sheridan road, from Rosemary avenue to the south city limits. The estimated quantities of the work are as follows: Excavation, 8,000 cubic yards; brick culvert, 75 feet; stone culvert, 70 feet by 5 feet; stone masonry, 355 feet; brick gutters, 1,600 lineal feet; macadam paving, 5,900 feet. Bids will be received at the same time for 11,000 lineal feet drain tiling, 42 catch basins and 700 feet of sewers. Jas. Anderson, jr., Cy. Eng.

Albany, N. Y.—Sealed proposals will be received until Sept. 7 for paving with granite blocks and paving brick the gutters of Harrison street, from Quay to South Pearl street; also for paving with brick Morris street, from Knox to Lexington avenue; Lexington avenue, from Knox to Thornton, and Ash Grove place and Westerlo street, from South Pearl street to Grand street. Sealed propcsals will be received until Sept. 7 for constructing pipe sewers and appurtenances under each sidewalk of Lexington avenue, from Washington to Clinton avenue. Thos. J. Lanahan, Clk.

Louisville, Ky.—A resolution was passed, Aug. 23, at a meeting of the Board of Directors of the Louisville Water Co., directing the Chief Engineer, Chas. Hermany and Prof. G. W. Fuller, in conjunction with the special committee on filtration and water purification to prepare plans and specifications for a complete system of filtration and water purification for the water supply of this city.

Lexington, Mass.—The construction of a water filter is contemplated.

for furnishing a water supply for fire protection and domestic purposes. Henry Brueggeman, Mayor.

Madison, Wis.—The council has instructed the engineers to proceed with the plans for the construction of a sewage disposal plant to be located near the pest house; estimated cost, $30,000.

Montclair, N. J.—Ordinances were drawn, at a meeting of the Town Council, Aug. 23, providing for the construction of sewers on Talbot, Forest and Elm streets.

New York, N. Y.—Bids are asked until Sept. 8, for constructing and improving sewers in Fiftieth street. Chas. H. T. Collis, commissioner public works.

Brooklyn, N. Y.—Bids are asked until Sept. 9 for the construction of sewers in two streets. Theo. B. Willis, commissioner city works.

Elmira, N. Y.—Bids will be received until Sept. 6, for the construction of sewers in several streets.

Bloomfield, N. J.—Bids were received, Aug. 16, for the construction of 3,000 feet of sewer work in Newark avenue and Harrison street, as follows: Donato Fusco, Montclair, N. J., 12-inch pipe, $17,537.88; 15-inch pipe, $18,367.88; Headley & Christie, Newark, N. J., 12-inch pipe, $9,224.50; 15-inch pipe, $11,519.50; P. H. Harrison & Sons, Newark, N. J., 12-inch pipe, $8,704.08; 15-inch pipe, $9,225.38; M. J. Callahan, city, 12-inch pipe, $12,083.50; 15-inch pipe, $13,823.50.

Ft. Wayne, Ind.—The contract for a sewer in Tecumseh street was awarded, Aug. 19, to J. P. Empie, city, at $2.30 per lineal foot.

Worcester, Mass.—Worcester county contemplates the purchase of a steam road roller, according to press reports.

Lawrence, Mass.—An appropriation of $5,000 has been made for granite block paving.

Hamden, Conn.—Bids are asked until Sept. 7 for paving Dixwell avenue. Jno. H. Davis, selectman.

Bloomfield, Conn.—Bids will be received until Sept. 30 for macadamizing sections of Bloomfield avenue. Geo. F. Hubbard, selectman.

Fairfield, Conn.—Bids are asked until Sept. 11 for macadamizing Benson road. Simon C. Bradley, chairman board selectmen.

Boston, Mass.—The contract for building the Blue Hills parkway, from Neponset to Brook road, Milton, was awarded, Aug. 23, to F. X. Saucier, of this city, for $14,748.20.

Killingly, Conn.—Contracts for building roads have been awarded as follows: Windsor, J. S. Lane & Son, $1.20 a lineal foot; Middletown, McDonald & Hennessey, 98 cents a lineal foot.

Woodsville, N. H.—The contract for constructing the new sewerage system has been awarded to A. R. Smith, of Plymouth.

Plainville, Conn.—The contract for building the state highway was awarded to C. B. Cadwell at $1.18 per running foot.

Newark, N. J.—Notice of intention has been published for paving Warren street with granite block on concrete foundation, and for the construction of an 18-inch pipe sewer in Jacob-street. The ordinance for paving Badger avenue with granite blocks and flagging Eigtheenth avenue has passed the third reading. Bids will be received until Sept. 7 for constructing several bridges.

THIS TRADE MARK

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